49 A

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REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES A.

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EDITORIAL

THE NOMENCLATURE OF CHEMICALS USED IN PEST CONTROL

It has been considered desirable to make some additions and alterations to the recent list of common names accepted in this *Review* for chemicals employed in pest control [*R.A.E.*, A **48** 1–7]. Since its publication, further common names have been approved by the British Standards Institution, and a complete revision of British Standard 1831: 1957 and its Supplements, incorporating them, is shortly to be issued. The additional names from this source that will be used in abstracts, normally without further chemical definition, are shown in the table below. It will be noted that the name azinphos-methyl is accepted for Guthion and mevinphos for Phosdrin, both of which were included in the earlier list [*loc. cit.*].

Common name used	Chemical names or definitions	Other names
azinphos-ethyl ..	O,O-diethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate O,O-diethyl S-(3,4-dihydro-4-oxobenzo[*d*]-[1,2,3]-triazin-3-ylmethyl) phosphorodithioate	Bayer 16259
azinphos-methyl ..	O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate O,O-dimethyl S-(3,4-dihydro-4-oxobenzo[*d*]-[1,2,3]-triazin-3-ylmethyl) phosphorodithioate	Guthion, Gusathion, Bayer 17147
chromaphon ..	O,O-diethyl O-(7,8,9,10-tetrahydro-6-oxo-benzo[*c*]chroman-3-yl) phosphorothioate	
coumaphos ..	O,O-diethyl O-3-chloro-4-methyl-7-coumarinyl phosphorothioate	Bayer 21/199, Co-Ral
fenchlorphos ..	O,O-dimethyl O-2,4,5-trichlorophenyl phosphorothioate	ronnel, Dow ET-14, Dow ET-57, Korlan, Trolene

Common name used	Chemical names or definitions	Other names
fenthion	O,O-dimethyl O-3-methyl-4-methylthiophenyl phosphorothioate	
mecarbam.. ..	O,O-diethyl S-(N-ethoxycarbonyl-N-methylcarbamoylmethyl) phosphorodithioate	
menazon	O,O-dimethyl S-(4,6-diamino-1,3,5-triazin-2-yl)methyl phosphorodithioate	
metham	N-methyldithiocarbamic acid It should be stated which salt or ester is present.	
mevinphos ..	dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate	Phosdrin
morphothion ..	O,O-dimethyl S-morpholinocarbonylmethyl phosphorodithioate	
prodizine	2-chloro-4-diethylamino-6-isopropylamino-1,3,5-triazine	

Distribution maps of pests.—Series A (Agricultural), nos. 115–120. London, Commonw. Inst. Ent., 1960.

These maps are nos. 115–120 of a series already noticed [*R.A.E.*, A **40** 203; **48** 317] and deal, respectively, with *Hylemyia coarctata* (Fall.), *Dysmicoccus boninsis* (Kuw.), *Ceroplastes destructor* Newst., *C. rubens* Mask., *Halotydeus destructor* (Tucker) and *Merodon equestris* (F.).

MAW (M. G.). **Notes on the larch sawfly,** *Pristiphora erichsonii* **(Htg.) (Hymenoptera: Tenthredinidae), in Great Britain.**—*Ent. Gaz.* **11** no. 1 pp. 43–49, 19 refs. Feltham, Middx., 1960.

The history of the occurrence of *Pristiphora erichsonii* (Htg.) on larch in Britain is reviewed. The sawfly is present in most areas where larch is grown, but in such small numbers that damage is negligible. Encapsulation of the eggs of its parasite, *Mesoleius aulicus* (Grav.) (*tenthredinis* Morl.) [*cf. R.A.E.*, A **43** 133], was unknown in Britain until 1955, when 29 per cent. of the eggs examined were encapsulated; though 54 per cent. of the larvae in 153 cocoons were parasitised, only 39 per cent. were killed by the parasite. Wasps (*Vespula vulgaris* (L.)) were observed attacking the larvae.

WHALLEY (P. E. S.). **The genus** *Ephestia* **Guenée (Lep., Phycitinae).**—*Ent. Gaz.* **11** no. 4 pp. 183–184, 4 refs. Feltham, Middx., 1960.

In the paper in which he erected the genus *Anagasta* for *Ephestia kühniella* Zell., C. Heinrich indicated that *Ephestia* should be restricted to *E. elutella* (Hb.) (the genotype), the species of the group of *E. cautella* (Wlk.) being generically distinct from it. A new genus, *Xenephestia*, was proposed for these by Gozmany in 1958, but it is here pointed out that the genus *Cadra* is available for them, because its type, *C. defectella* Wlk., is a synonym of *E. cautella*, and *E. cautella*, *E. calidella* Gn., *E. figulilella* Gregson and *E. woodiella* Richards & Thomson, the four remaining British species, are transferred to it.

DAS (G. M.). **Occurrence of the red spider,** *Oligonychus coffeae* **(Nietner), on tea in north-east India in relation to pruning and defoliation.**—*Bull. ent. Res.* **51** pt. 3 pp. 415–426, 9 refs. London, 1960.

Control of *Oligonychus coffeae* (Nietn.) on tea in north-eastern India [*cf. R.A.E.*, A **47** 369] by means of acaricides is difficult, because more than two applications may be needed during the plucking season and persistent materials are liable to taint the leaves. Cultural measures affect the incidence of the mite, however, and the following is based almost entirely on the author's summary of this account of studies on the effects of pruning and defoliation.

All stages of *O. coffeae* persist on a few old leaves and on the scale-leaves (cataphylls) at the base of the shoots during the cold weather, and this small population is primarily responsible for the attack in spring. In pruning, a great many of the old leaves, including the scale-leaves, and with them the mites, are removed from the bushes. Pruned tea is, therefore, less attacked than unpruned tea or ' skiffed ' tea (where just a little is cut off the tops of the shoots), in both of which comparatively more leaves are left on the bushes. Early-pruned tea is more subject to attack than late-pruned tea, but there is little difference in effect between early and late cleaning out (which includes removal of dead snags and weak and crossing branches), and also between early and late skiffing. The degree of cleaning out has a direct influence on the incidence of *O. coffeae*. The more leaves removed, the less is the attack. Tea that has been defoliated as a preventive measure against subsequent attack remains practically free from the mite. Medium-pruned tea, from which almost all the leaves are automatically removed, remains almost free from attack, as after defoliation. Young laterals on pruned bushes are usually not defoliated, nor are young infills, and they may be sources of infestation, but it is customary to treat them with an acaricide to prevent the spread of attack. Different heights of plucking have no observable effect on mite attack. Bushes along main roads sometimes become covered with dust and are severely attacked by *O. coffeae*. This increase appears to be due mainly to the presence of more laterals carrying more mites on the first row by the side of the road, and also to the lower incidence of predators on dust-covered bushes during the cold weather. Abandoned tea is severely attacked in the first year, but as the trees grow larger the degree of attack decreases progressively. *O. coffeae* is virtually absent from tea seed-gardens, but slight infestation occasionally appears on border trees.

JEPSON (W. F.) & MATHIAS (P.). **The control of frit fly,** *Oscinella frit* **(L.), in sweet corn (***Zea mays***) by Thimet (O,O-diethyl S-ethylthiomethyl phosphorodithioate).**—*Bull. ent. Res.* **51** pt. 3 pp. 427–433, 1 fig., 16 refs. London, 1960.

The following is virtually the authors' summary. Sweet maize is frequently attacked by *Oscinella frit* (L.) in southern England because the optimal sowing date (1st–20th May) determines the appearance of the seedlings at the peak of the spring flight (13th–30th May). A latin-square experiment including three treatments with phorate (Thimet) and controls showed that almost complete protection could be given by seed-furrow and surface placements along the rows of an 8 per cent. granular formulation at the rate of 2 lb. actual phorate per acre. The crop on the untreated control plots was more than halved by the naturally occurring infestation of 45 per cent. of the primary shoots. Estimation of phorate residues in cobs taken from the seed-furrow treatment showed that only a very minute trace of toxic material was present. Tasting tests on cobs from treated plots revealed no detectable taint.

Yule (W. N.). **Dieldrin lattices applied by aircraft for controlling hoppers of the red locust,** *Nomadacris septemfasciata* (**Serville**).—*Bull. ent. Res.* **51** pt. 3 pp. 441–460, 2 figs., 23 refs. London, 1960.

The following is substantially the author's summary. Large-scale operational trials of dieldrin lattices applied by aircraft for the control of hoppers of *Nomadacris septemfasciata* (Serv.) [*cf. R.A.E.*, A **48** 330] were carried out in the North Rukwa outbreak area in south-western Tanganyika in 1958 and 1959. Single swaths of dieldrin emulsion spray were applied to vegetation at wide intervals and in two directions at 90° to each other, forming a rectilinear lattice distribution of poisoned strips of vegetation over large hopper-infested areas. Hoppers, especially those in bands, were killed on eating the poisoned vegetation which they encountered during their migrations. An accurate method of lattice lay-out by aircraft pilots without assistance from ground marking-parties was developed, and the whole operation was used on a large scale for controlling the hopper infestation in North Rukwa in 1959. The results of seven trials, using several lattice-spacings and dosages of dieldrin against hoppers in different instars, indicated that various useful levels of control could be obtained with different combinations of these three factors. Combinations of lattice-spacings of 250–750 yards with dieldrin at dosages of 1·1–4·5 oz. per acre of swath against the third, fourth and fifth instars were calculated to give 50–100 per cent. control of various infestation levels of these three instars, at a cost of 0·375–1·5 shillings per acre. It was calculated that a total infested area of 330 sq. miles could be sprayed with lattices by two aircraft while the hoppers were in the third, fourth and fifth instars. The aerial dieldrin-lattice method is compared with the best previous ground method of hopper control [*cf. loc. cit.*], and it is shown that the new method is cheaper, more effective and more practicable than the old one, besides enabling fuller aircraft utilisation and further simplification of organisation to be obtained. A change in control strategy to concentrate once more on hoppers rather than adult locusts, as in the recent past, is recommended, so that preventive control of *N. septemfasciata* can be obtained with greater economy and security.

Odhiambo (T. R.). **The identity of** *Pseudodoniella laensis* **Miller (Hemiptera, Miridae), associated with cacao in New Guinea and Papua.**—*Bull. ent. Res.* **51** pt. 3 pp. 519–521, 2 figs., 1 ref. London, 1960.

Examination of specimens of *Pseudodoniella laensis* Miller and *P. szentivanyi* Miller [*cf. R.A.E.*, A **45** 217] in the British Museum showed no specific differences between them. As *P. laensis* has paragraph priority, *P. szentivanyi* is a synonym of it.

FERNANDO (H. E.). **A biological and ecological study of the rice Pentatomid bug, *Scotinophara lurida* (Burm.) in Ceylon.**—*Bull. ent. Res.* **51** pt. 3 pp. 559–576, 2 pls., 8 refs. London, 1960.

The following is substantially the author's summary. *Scotinophara lurida* (Burm.) is widely distributed in Ceylon in areas where rice is grown under irrigation. It first became a serious pest in 1940 [*cf. R.A.E.*, A **30** 281] and has periodically since then assumed epidemic proportions in the Southern Province, where two crops of rice are grown annually. Each crop matures in 3½–4 months, and the fields lie fallow in the intervening periods, during which the insects aestivate, in the adult or late nymphal stages, in cracks in the bunds in the rice-fields or on neighbouring higher ground. They remain motionless for the most part during aestivation, are gregarious and occur as much as 2 ft. below ground-level. The adults leave the aestivation sites in April and May and settle in the first crop, when it is 2–3 weeks old, and a subsequent aestivating population behaves similarly in November and December for the second crop. There is at first considerable flight activity at dusk and at night. After the bugs have fed for about a week on the rice seedlings, pairing takes place, and oviposition begins about ten days later. Egg-masses in the field usually consist of two rows, each containing seven eggs, but under artificial conditions the numbers of eggs and rows were considerably greater. At 75 per cent. relative humidity and 25–28°C. [77–82·4°F.] in the laboratory, the average duration of the egg stage and five nymphal instars was 6, 5, 9, 7, 9 and 12 days, respectively. There are four overlapping generations in the year. The first generation and part of the second are produced on the first crop, and the remainder of the second, the third and a part of a fourth generation on the second crop. The periods intervening between the two crops are passed in aestivation by the nymphs or adults of two overlapping generations.

Damage to rice in the field consists of localised leaf lesions, chlorotic lesions, which gradually dry up and frequently result in the death of that portion of the leaf between the lesion and the leaf tip, death of the central shoot or death of the entire plant. Laboratory experiments showed that feeding near the growing point of a seedling always leads to death of the plant without subsequent tillering but, when feeding took place more than 1·5 in. above the growing point, the leaves developed necrotic patches and dried off but the plant tillered and the rest of it grew normally. The nature of the chlorotic areas surrounding the initial lesions may be due to the diffusion of a toxic compound in the salivary secretion of the insect.

No predators of *S. lurida* have been recorded in Ceylon. The eggs are parasitised by *Telenomus triptus* Nixon [**26** 89], and parasitism in the field was assessed at between 30 and 36 per cent. in the years 1953–55. The parasite lays only one egg in each host egg attacked. Details are given of parasite oviposition, its effect on the host egg, and parasite development from laboratory observations. *S. lurida* is a major pest of rice in China and Japan, and its behaviour in Japan [*cf.* **18** 592] is compared with that in Ceylon.

INGRAM (W. R.). **The control of yellow tea mite, *Hemitarsonemus latus* (Banks), with DDT on cotton in Uganda.**—*Bull. ent. Res.* **51** pt. 3 pp. 577–582, 1 graph, 11 refs. London, 1960.

The following is substantially the author's summary. Damage to cotton by *Hemitarsonemus latus* (Banks) was seen in Uganda for the first time in 1945 and is now known throughout the important cotton-growing areas of the country. Experiments in the Belgian Congo showed that several insecticides could control or prevent infestation [*cf. R.A.E.*, A **46** 45]; earlier published work in Uganda suggested that BHC reduced damage and that DDT increased it, when both were applied as wettable-powder sprays. However, damage by *H. latus* was not noticeable on trials in which single rows of cotton were treated with DDT emulsion sprays or in large-scale trials using DDT formulated as a water-miscible liquid. These trials were all directed against *Earias* spp. and *Lygus vosseleri* Popp., the standard rate of application being 1 lb. active ingredient per acre applied four times at ten-day intervals.

Results are given of three trials at Serere in 1959, in which certain plots were protected against *Earias* spp. and *L. vosseleri* by DDT applied in a miscible-liquid formulation at the rate of 1 lb. active ingredient per acre per application, the number and timing of the applications differing. Damage by *H. latus* was estimated as the number of plants showing any symptoms in samples taken at random. In each trial there was less damage on the sprayed plots, and the reduction was highly significant in two of the trials. One of them was a plant-spacing trial; damage by *H. latus* did not vary significantly with plant spacing on sprayed plots, but on the unsprayed cotton the amount of damage rose with wider spacing. This appears to be a contradiction of results obtained in the Congo. As yet, no trials have been carried out using only acaricides with no effect on insects, to try to distinguish between any reduction in yield due to mites and that due to insects. Results of examinations of cotton plants with and without symptoms of mite attack suggest that although *H. latus* may cause some early loss of fruiting bodies the plants subsequently recover and form new ones; moreover, in unsprayed cotton, plots of widely spaced plants, although showing the highest mite damage, gave the highest yield. *H. latus* is recorded as causing yield reductions of up to 70 per cent. in the Congo [*loc. cit.*], but such effects are not experienced in Uganda.

BREESE (M. H.). **The infestibility of stored paddy by** *Sitophilus sasakii* **(Tak.) and** *Rhyzopertha dominica* **(F.).**—*Bull. ent. Res.* **51** pt. 3 pp. 599–630, 2 figs., 24 refs. London, 1960.

The following is based almost entirely on the author's summary. Indications of the type of rough rice grain most commonly infested by the small strain of *Sitophilus oryzae* (L.), for which the name *S. sasakii* (Tak.) was recently adopted [*R.A.E.*, A **48** 130, etc.], and *Rhyzopertha dominica* (F.) were obtained from an examination of infested samples of paddy grown in Trinidad and British Guiana. Small-scale experiments with sound mature paddy showed that *Sitophilus* is unable to feed and breed in a grain with an intact husk, even when the moisture content is high. Its rapid multiplication is dependent on a high proportion of grains with badly damaged husks. Infestation can occur in grains with a slight separation of the lemma and palea or with slightly split husks, but the adults that develop are often unable to emerge from such grains. It is also probable that *R. dominica* finds it difficult to infest intact grains. The larvae readily make use of even minute husk defects in order to gain access to the kernel, and their entry may also be effected by boring along the centre of the rachis, which is easier in incompletely developed and green grains than in those that are full and mature. Entry by this method is usually restricted to a single larva, and the mortality is high. The degree of husk damage and the amount of hulled and broken grains in paddy may often be related to the method of harvesting and threshing. In British Guiana, combine-harvested paddy generally has a much higher proportion of damaged grains than paddy harvested and threshed by traditional peasant methods. When combine-harvested paddy is stored at a high moisture content, conditions may be favourable for the development of high infestations of both insects.

WALLACE (C. R.). **Report on an investigation of agricultural pests in St. Helena, 1957–1959.**—ii + 54 pp., 33 refs., multigraph. [London] Colon. Off., 1960.

This detailed report on insect and other invertebrate pests in St. Helena is based on investigations made from September 1957 to September 1959. The earlier sections show the numerous pests of the various crops, forest trees, ornamental plants and stored products encountered, with consideration of their importance and of biological and other methods of control, and the later ones are concerned with individual species, or groups of species, and their control. The agricultural pests of most importance are stated to be Tetranychids, leaf-eating caterpillars (particularly larvae of *Prodenia litura* (F.)), *Thrips tabaci* Lind. (on onions), cutworms, aphids, *Gnorimoschema operculella* (Zell.) (on potato), *Ceratitis capitata* (Wied.), *Trioza erytreae* (Del. G.) (on *Citrus*), *Argyroploce* (*Olethreutes*) *leucotreta* Meyr. (on peach), mealybugs, and *Acanthoscelides obtectus* (Say) (in stored beans).

INGRAM (W. R.). **Experiments on the control of stalk borers on sorghum in Uganda.**—*E. Afr. agric. J.* **25** no. 3 pp. 184–187, 5 refs. Nairobi, 1960.

Sorghum in Uganda is attacked by several stalk-borers, of which the more important are *Busseola fusca* (Fuller), *Sesamia calamistis* Hmps. and *Chilo zonellus* (Swinh.). Three tests on their control were carried out in 1956 and 1958, and the following is based on the author's summary of the work.

The treatments consisted of DDT in dusts and a miscible liquid applied at various rates and intervals to the funnels of the plants and an over-all blanket spray of dieldrin applied throughout the growth of the sorghum. A trial in the first rains failed, since no borers attacked the crop. Two second-rains trials gave varying degrees of borer control, *C. zonellus* being the commonest species present, but no significant increase in yield was observed, owing to an increase in the number of tillers in the untreated plots and a corresponding increase in the numbers of heads, which, though weighing less, evened out the yield.

BÜNZLI (G. H.) & BÜTTIKER (W. W.). **Host-plants of *Myzus persicae* Sulz., with a list of aphids of common occurrence in the tobacco growing districts of S. Rhodesia.**—*J. ent. Soc. S. Afr.* **22** no. 1 pp. 35–50, 27 refs. Pretoria, 1959.

Myzus persicae (Sulz.) is an important pest of tobacco in Southern Rhodesia, and investigations on its alternative food-plants and natural enemies were made in 1949–51. Reproduction was found to be exclusively anholocyclic, although peach, the primary food-plant, is present [*cf. R.A.E.*, A **48** 312]. In the absence of tobacco, small numbers of *M. persicae* were found on potato and other solanaceous crops, beet, various cultivated crucifers, ornamental plants and weeds. No evidence was obtained to support the view that two strains are involved [**31** 155].

The aphid was common on tobacco, but rare on potato, of which two crops are grown each year, and the reason for this was investigated in the winter of 1949. Small influxes of *M. persicae* and *Macrosiphum euphorbiae* (Thos.) were constant on potato, but Coccinellids of the genus *Cheilomenes* (*Cydonia*) prevented the establishment of many colonies. Potatoes planted in August between tobacco plants heavily infested by *Myzus persicae* kept free from the aphids by *C.* (*C.*) *sulphurea* (Ol.), but the predator did not migrate to the fully grown tobacco, on which the aphids were attacked by the Braconid, *Aphidius matricariae* Hal., and by Syrphid larvae. Alates and apterae developed normally on potato when protected from natural enemies. *Cleome monophylla*, a known wild food-plant in Nyasaland, growing in a heavily infested tobacco field was not infested in February–March 1950, when all the known natural enemies, including *Cheilomenes* (*Cydonia*) *geisha* (Gorh.), the Syrphids, *Xanthogramma aegyptium* (Wied.) and *X. pfeifferi* Big., and *A. matricariae* were present. The large, soft leaves of tobacco permit large populations of both aphid and natural enemies to develop, and although the latter cannot control vigorous established colonies of *M. persicae*, they eliminate incipient or weak populations on other plants growing in the crop. Adult Coccinellids are of particular importance, especially during the cooler months, since they chiefly attack aphids on low-growing plants. Syrphid larvae normally occur on the upper parts of tobacco plants, where colonies of *M. persicae* are dense. The commonest natural enemy on tobacco was *A. matricariae*, which breeds throughout the year, but it did not parasitise *Macrosiphum euphorbiae*, which attacks many plants and is the commonest aphid in Rhodesia, even when it was accompanied by *Myzus persicae*, and did not parasitise the latter on chilli (*Capsicum annuum*). The suitability of an aphid as a host may therefore be influenced by its food-plant.

In winter, aphid numbers are reduced by scarcity of food-plants, but *M. persicae* was numerous on the topmost leaves and flower-heads of tobacco grown out of season and irrigated at intervals, even in an unsheltered situation. Low-growing alternative food-plants persist in suitable environments, and alates migrate or are blown over considerable distances from these to tobacco, so that protection of seedbeds is necessary. Attempts to rear *M. persicae* on tobacco cotyledons were unsuccessful, but the risk of infestation increases as the season progresses, and routine spraying is necessary as soon as the seedlings are uncovered. As a result of improved seedbed management, primary attack now usually takes place in the field. Aphid numbers build up quickly, but rainstorms can destroy well-established colonies on young plants. The distribution of alates and apterae and of visibly parasitised aphids on individual tobacco plants with infestations of different intensities are shown in tables. The aphids were largely confined to the lower surface of the leaves except on a heavily infested plant, where some apterae and a few alates were on the upper surface. Parasitised aphids were invariably on the lower surface of the leaf. Parasitism in early March on three plants ranged from 0·8 to 28 per cent. By April, it had increased, but the parasite populations built up too late to afford control.

A list of 46 plants showing the common aphids that occur on them in Southern Rhodesia and their seasonal abundance is included.

Yule (W. N.) & Lloyd (J. H.). **Observations on migration of hopper bands of the red locust** (*Nomadacris septemfasciata* **Serville**) **in an outbreak area.**—*J. ent. Soc. S. Afr.* **22** no. 1 pp. 233–244, 2 figs., 22 refs. Pretoria, 1959.

The following is based partly on the authors' summary. Studies were made on the migration of hopper bands of *Nomadacris septemfasciata* (Serv.)

in an outbreak area in the Rukwa Valley, Tanganyika, in January–March 1957. Most hoppers appeared to be in phase *transiens*. Bandlets (groups of less than 1,000 hoppers) were found to move in random directions, while large, dense bands each maintained a fairly constant direction over a number of days. This difference arose as a result of the greater numbers, increased gregariousness and peculiar distribution of hoppers in the bigger bands, in which a dense leading mass of hoppers was followed by a line of stragglers [*cf.* *R.A.E.*, A **38** 389]; the movement of the band was initiated in the morning by a forward movement of the stragglers towards the dense mass. Sun and wind seemed to have no directive influence on band movement, but sharp changes in the height and density of the grass (*Echinochloa*) caused alterations in direction and rate of movement. The hoppers paused at the edge of tall vegetation or followed the boundary between long and short grass. The rate of movement was slowest through grass of varying height and through uniform, thick grass and on cold, wet and very windy days; it was greatest over continuous, short, less dense grass, on warm sunny days with a cooling breeze, and when air temperatures between 8 a.m. and 4 p.m. ranged between 23 and 30°C. [73·4 and 86°F.]. Large dense bands moved faster and more directly than small ones, dense bands moved faster than less dense ones, and older hoppers faster than younger ones.

ANNECKE (D. P.). **The effect of parathion and ants on** *Coccus hesperidum* **L. (Coccidae: Hemiptera) and its natural enemies.**—*J. ent. Soc. S. Afr.* **22** no. 1 pp. 245–274, 10 figs., 22 refs. Pretoria, 1959.

Coccus hesperidum L. has since the adoption of phosphorus insecticides for the control of *Aonidiella aurantii* (Mask.) become a serious pest of *Citrus* in all the major areas of South Africa [*cf.* *R.A.E.*, A **39** 337; **44** 264]. It favours the development of sooty mould, and observations at Zebediela, in the northern Transvaal, showed that it caused sunburn to develop on young fruits. Affected fruits were blackened by mould and, since they were usually in sunny positions and temperatures at Zebediela are high, the injury is attributed to heat absorbed by the black surface. Ants are known to foster the infestation [*cf.* **35** 127; **44** 455, 457], but no attempt is made to control them.

This association and the effect of parathion on it were studied between June 1956 and April 1957 at Zebediela. All stages of *C. hesperidum* were present throughout the period, but no males were observed. Adult females and crawlers showed peaks of abundance about mid-October and again in early February, and there were also indistinct peaks of older nymphs. Populations evidently age in such a way that three peaks of each development stage are apparent each year; these are associated with the duration of the life-cycle of the bulk of the population and are termed 'effective generations'.

The spray of 3 lb. 25 per cent. wettable parathion per 100 gal. normally applied in September was withheld from half the experimental trees, and the stems of half the sprayed and unsprayed trees were sprayed and banded with dieldrin to eliminate the dominant ant, *Pheidole megacephala* (F.) [*cf.* **44** 457], which was present on all but 3 per cent. of them. *C. hesperidum* gradually died out on all the trees, possibly owing to the persistence of parasites and predators on the unsprayed ones, and no living Coccids were recovered after the end of March. They were present on sprayed trees for nearly six weeks longer than on unsprayed ones in the absence of ants, however, and for 3–4 weeks longer in their presence; the difference is attributed to the destruction of beneficial insects by the parathion. Infestation persisted for 6–9 weeks longer where ants were present than where they were not on unsprayed trees and for 3–6 weeks longer on sprayed trees. Adults of the Coccinellids, *Chilocorus angolensis* Crotch, which preys on *Coccus hesperidum*, and *Exochomus flavipes* (Thnb.), which preys on *A. aurantii*, were more numerous, but not significantly so in the case of the former, in the absence than in the presence of ants; furthermore, pupae of *Chilocorus* were frequent on ant-free trees, but rare where ants were present. Fewer Coccids were killed by predators on ant-infested than on ant-free trees. A large complex of Hymenopterous parasites, of which the species and relative numbers varied throughout the period, was present, and examination of third-stage nymphs indicated that parasitism was inhibited by the presence of ants and also, apparently, by the omission of the parathion spray, which affected ants only temporarily or not at all, but the differences were not statistically significant, possibly because of the decreasing host population and the complexity of the associations. There was also considerable Coccid mortality that could not be attributed to any cause, whatever the treatments.

RIVNAY (E.) & YATHOM (S.). **Field trials against the spiny boll worm** *Earias insulana* **Boisd. in cotton in 1957.**—*Ktavim* (Engl. edn.) **9** no. 1–2 pp. 3–17, 5 figs. Rehovot, 1958.

In 1957, spray experiments were carried out in Israel to study the effectiveness of certain insecticides, particularly azinphos-methyl (Gusathion), against *Earias insulana* (Boisd.) on cotton, and to compare them with endrin [*cf. R.A.E.*, A **47** 230, etc.]. The preceding winter had been long and severe, the appearance of *Earias* larvae was delayed and the population did not increase significantly until the end of August in any of the test areas. Attacks by other Noctuids occurred, usually before the appearance of *Earias*, but they were not severe and endrin afforded satisfactory control. Where damage was largely due to *Earias*, sprays of azinphos-methyl, alone or with malathion, proved very effective and resulted in the greatest increases in yield, except when infestation was very heavy. Lindane [γ BHC] and parathion were ineffective, probably because they deteriorated in the summer heat. Periodic applications throughout the summer or every fortnight during the period of heaviest infestation did not give good results, and it is recommended that applications should be delayed until the larvae appear and should then be repeated frequently.

SWIRSKI (E.). **Further trials in the control of the citrus rust mite** (*Phyllocoptruta oleivora* **Ashm.**).—*Ktavim* (Engl. edn.) **9** no. 1–2 pp. 43–56, 4 figs., 11 refs. Rehovot, 1958.

In view of the increased importance of *Phyllocoptruta oleivora* (Ashm.) on *Citrus* in Israel [*cf. R.A.E.*, A **48** 496], further experiments on its control were carried out in 1956–57. The acaricides previously in use gave good control in summer [**46** 274], but had serious disadvantages, sulphur being ineffective in winter, diazinon being liable to upset the biological equilibrium, and some compounds causing spots on the fruits. In the first experiment, on winter treatments, sprays containing 1 per cent. lime-sulphur, 0·1 per cent. chlorobenzilate or 0·05 per cent. diazinon were applied to infested branches of Jaffa orange on 2nd February. Lime-sulphur was very effective for about 53 days and chlorobenzilate for about 24, but diazinon gave low initial kill and soon lost its toxicity. In the second, chlorfenson at 0·8 per cent., phenkapton at 0·13 per cent. and amiton oxalate (R6199) at 20 parts per million were compared with 0·1 per cent. chlorobenzilate. In sprays applied on 7th July, the first proved unsatisfactory, phenkapton and chlorobenzilate were very effective for 37 days, and amiton oxalate gave control for 56 days. However, the last has been withdrawn from commerce because of its toxicity to man. The third experiment, in which amiton oxalate was not used, was on a larger scale than the second and gave similar results, phenkapton being apparently equal or superior to chlorobenzilate. Phenkapton at 0·12 per cent. was tested in the fourth experiment, on a commercial scale over an acre of trees. The initial kill was high, and population increase was checked for some three months. In the fifth experiment, amiton oxalate at 20 p.p.m. was applied on 16th November to four trees. Populations were reduced and remained low for 60 days, until harvest. In the sixth, on winter treatments, infested branches were sprayed on 8th February with amiton oxalate at 10 and 20 p.p.m., phenkapton at 0·12 per cent. and diazinon at 0·05 per cent. All gave significant control, but the experiment was terminated because of a natural decline in the population. In the seventh experiment, diazinon was applied to infested lemon branches on 20th February. The mite population was reduced in a week but began to rise again after 24 days. In the eighth experiment, amiton oxalate at 46 p.p.m. was applied to each of 124 orange trees on 26th June. Almost complete control was achieved for 55 days, and there was a significant reduction in population for 98 days.

The inclusion of oil in the chlorobenzilate sprays was found to cause ring-like brown stains on orange. Diazinon at 0·04–0·07 per cent. with oil caused severe staining, and the use of a spreader also resulted in injury. Fruits dusted with sulphur and exposed to the sun showed scorching, but wettable-sulphur sprays caused negligible damage. Lime-sulphur tended to leave a white deposit, and where this cannot be washed off after picking, chlorobenzilate is preferable as the winter spray.

Sankaran (T.). **A note on two parasites of** *Phenacoccus insolitus* **Green (Hemiptera: Coccidae).**—*Proc. R. ent. Soc. Lond.* (A) **34** pt. 1–3 pp. 25–26, 4 refs. London, 1959.

Adults of *Leptomastix nigrocoxalis* Comp. [*cf. R.A.E.*, A **16** 276] and *Cheiloneurus latiscapus* Comp. [*cf.* **27** 40; **37** 56] emerged in September 1950 from *Centrococcus (Phenacoccus) insolitus* (Green), a pest of brinjal (*Solanum melongena*), collected in Uttar Pradesh. Neither has been reported previously from India. *Leptomastix* was reared chiefly from female nymphs and adults of *C. insolitus*, and some that emerged from male nymphs were stunted. *Cheiloneurus* emerged from advanced female nymphs and adults parasitised by *Leptomastix* and may be hyperparasitic [*cf.* **27** 40].

Pradhan (S.), Jotwani (M. G.) & Rai (B. K.). **Bio-assay of insecticides. X. Comparative toxicity of some important insecticides to** *Cylas formicarius* **Fabricius and** *Myllocerus undecimpustulatus maculosus* **Desbrochers (Curculionidae: Coleoptera).**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 171–174, 2 refs. New Delhi, 1959.

In this part of a series on the toxicity of insecticides to Indian insects [*cf. R.A.E.*, A **48** 208], details are given of tests in which adults of two weevils, *Cylas formicarius* (F.), a pest of sweet potatoes, and *Myllocerus undecimpustulatus maculosus* Desbr., a pest of cotton and sorghum (jowar), were confined for four hours at about 26°C. [78·8°F.] on films of insecticide obtained by spraying petri dishes in a Potter tower and drying. Mortality was calculated 48 hours later. Against *Cylas*, the LC50 of p,p′DDT was 1·24 per cent. (w/v). All the other materials were more toxic than this, the ratios to DDT being 7·7 for chlordane, 56·5 for aldrin, 58·1 for dieldrin, 108·1 for malathion, 108·4 for lindane [almost pure γ BHC], 224·1 for isodrin, 272 for endrin, 559·3 for demeton (Systox), 985·7 for diazinon and 1,153·5 for parathion; toxaphene was ineffective even at 2 per cent. Against *Myllocerus*, the LC50 for p,p′DDT was 0·057 per cent., and the ratios for the other materials were 0·17 for aldrin, 0·36 for endrin, 0·48 for diazinon, 0·52 for demeton, 0·92 for γ BHC, 1·79 for parathion and 1·94 for malathion.

Kanakaraj David (S.). **A new genus and three new species of aphids from India.**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 175–180, 1 fig., 4 refs. New Delhi, 1959.

The three aphids described are *Micromyzodium filicium*, gen. et sp.n., on ferns in conservatories at Ootacamund, *Macrosiphum leelamaniae*, sp.n., on *Eleusine coracana*, sorghum and *Pennisetum typhoides* at Coimbatore, and *Astegopteryx formosana* subsp. *neelagiriensis*, n., on bamboo (*Bambusa* spp.) in Coonoor.

Sharma (A. K.) & Subba Rao (B. R.). **Description of two new parasites of an aphid from North India (Aphidiidae: Ichneumonoidea and Pteromalidae: Chalcidoidea).**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 181–188, 11 figs., 9 refs. New Delhi, 1959.

Asaphes sawraji and *Aphidius smithi*, spp.n., are described from adults of both sexes. They are primary parasites of *Macrosiphum* (*Acyrthosiphon*) *pisum* (Harris) on garden pea (*Lathyrus odoratus*) at Kalka, in the Punjab (India).

Puttarudriah (M.) & Sivashankara Sastry (K. S.). **Studies on the biology of *Tetrastichus ayyari* Rohwer, with attempts to utilise it in the control of sugarcane borers.**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 189–198, 2 figs., 3 refs. New Delhi, 1959.

Tetrastichus ayyari Rohw., all stages of which are described, was found parasitising *Chilo zonellus* (Swinh.) on sorghum in Mysore in 1950. It was reared on pupae of *Corcyra cephalonica* (Stnt.) and other Lepidoptera in the laboratory, and the complete life-cycle from egg to adult lasted 14–18 days. Adult males and females lived for 4 and 6–8 days without food and for 6–8 and 12–32 days when honey was provided. Females were more numerous than males and gave rise to 19–177 adult progeny each per host attacked, according to host size and species. Unmated females also reproduced. It successfully parasitised *Scirpophaga nivella* (F.) in the laboratory and was released against this borer on sugar-cane in the field at various places in 1950–55. Host density was low, and no recoveries were made.

Subba Rao (B. R.) & Sharma (A. K.). *Trioxys* (*Trioxys*) *indicus*, **new species, a parasite of** *Aphis gossypii* **Glover.**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 199–202, 7 figs., 2 refs. New Delhi, 1959.

Trioxys indicus, sp.n., is described from adults of both sexes reared from *Aphis gossypii* Glov. on egg-plant [*Solanum melongena*] in Delhi in 1956.

PRADHAN (S.) & SARUP (P.). **Relative toxicity of some organic insecticidal films to three species of Coleopterous pests of stored grain.**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 221–227, 3 refs. New Delhi, 1959.

In further tests of the toxicity of insecticides to pests of stored grain in India [*cf. R.A.E.*, A **45** 394], adults of *Latheticus oryzae* Waterh., *Rhyzopertha dominica* (F.), and *Sitophilus* (*Calandra*) *oryzae* (L.) were exposed to films from emulsion sprays applied to petri dishes in a Potter tower and allowed to dry. When mortality was calculated after exposure of *Latheticus* for 48 and (in brackets) 96 hours the LC50's for p,p′DDT were 0·0085 (0·0314), and the ratios to this of the LC50's of the other materials were 0·37 (2·06) for aldrin, 0·82 (0·99) for toxaphene, 1·5 (6·96) for dieldrin, 1·93 (9·89) for endrin and 5·18 (5·34) for γ BHC. After exposure of *Rhyzopertha* for 48 hours, the LC50 of p,p′DDT was 0·02, and the ratios for the other materials were 1·05 for toxaphene, 2·41 for aldrin, 4·45 for dieldrin, 9·57 for γ BHC and 14·52 for endrin. The LC50 of p,p′DDT for *Sitophilus* after exposure for 24 hours was 0·098, and the ratios for the other materials were 0·996 for toxaphene, 18·11 for endrin, 37 for γ BHC and 47·25 for dieldrin.

SRIVASTAVA (U. S.) & BAHADUR (J.). **Observations on the life history of red cotton bug,** *Dysdercus cingulatus* (**Hemiptera: Pyrrhocoridae**).—*Indian J. Ent.* **20** (1958) pt. 3 pp. 228–234, 6 figs., 3 refs. New Delhi, 1959.

Dysdercus cingulatus (F.), all stages of which are described, is an important pest of cotton, *Hibiscus esculentus* and other malvaceous plants in India. Observations on its life-history at room temperature at Allahabad showed that pairing is prolonged and usually occurs only once, that eggs are laid 8–24 hours later in crevices or soft moist soil in a single batch of 100–130, or occasionally in two unequal batches, and that the egg stage and five nymphal instars last 4–5, 2·5–3, 2·5–4, 3·5–4, 4–6 and 13–14 days, respectively.

BERI (Y. P.). **Preliminary studies on the effect of DDT spray on the oviposition of** *Plutella maculipennis* **Curtis.**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 235–236, 1 ref. New Delhi, 1959.

In a test on cabbage in Queensland, females of *Plutella maculipennis* (Curt.) deposited significantly fewer eggs on plants sprayed with DDT than on untreated ones, a repellent effect of the deposit apparently being responsible.

SINGH (Sardar) & SINDHU (A. S.). **Cotton thrips** (*Thrips tabaci* **Lindeman**) **and its control.**—*Indian J. Ent.* **20** (1958) pt. 3 pp. 238–240. New Delhi, 1959.

Thrips tabaci Lind. appeared in large numbers on American cotton in several districts in the Punjab (India) in May 1957. Spraying with a 0·1 per cent. suspension of DDT gave 96·7 per cent. corrected mortality in 96 hours, and the corresponding percentages for other materials compared with it in emulsion sprays were 100 for 0·02 per cent. endrin or diazinon, 94·27 for 0·01 per cent. endrin and 93·83 and 88·17 for 0·1 and 0·05 per cent. malathion.

BUTANI (D. K.). **Parasites and predators recorded on sugarcane pests in India.**—*Indian J. Ent.* **20** (1958) pt. 4 pp. 270–282, 45 refs. New Delhi, 1960.

This systematic list of the parasites and predators that attack insect pests of sugar-cane in India includes notes on their hosts and bionomics, records of local distribution and pertinent references to the literature.

VENUGOPAL (S.). **Studies on** *Hyposidra sucessaria* **Walker, a Geometrid pest on** *Sesbania speciosa* **in South India.**—*Indian J. Ent.* **20** (1958) pt. 4 pp. 283–290, 4 figs., 10 refs. New Delhi, 1960.

Sesbania speciosa is an important green manure crop in Madras State, and is attacked by several pests, including *Hyposidra talaca* (Wlk.) (*sucessaria* (Wlk.)). All stages of this Geometrid are described, its food-plants are reviewed, and notes on its life-history based on observations at Coimbatore in 1953–55 are given. The females laid 250–300 eggs each in 5–6 days, and the larvae, which feed on the leaves, hatched in 4–5 days and became full-fed in 18–20 days. The pupal stage is passed among fallen leaves and lasted 8–9 days. Four generations occurred between June and November, when the crop is present in the field. In tests on control, complete mortality was given in 48 hours by 0·1 per cent. BHC, aldrin or dieldrin; DDT was inferior.

LALL (B. S.). **On the biology of** *Apanteles obliquae* **(Wlk.), a larval parasite of** *Diacrisia obliqua* **(Wlk.).**—*Indian J. Ent.* **20** (1958) pt. 4 pp. 291–295, 9 refs. New Delhi, 1960.

Diacrisia obliqua (Wlk.) is a pest of vegetables and other crops in Bihar and is parasitised by *Apanteles obliquae* Wlkn. This Braconid was reared in the laboratory, and its life-cycle was found to average 16·2 days in February–March and 24·5 days in November–January. The females laid 61–103 eggs each, in 8–15 host larvae, and the total numbers of cocoons obtained from 8 and 15 host larvae were 55 and 91, respectively. Parasitism in the field in August–March was lowest in March and highest in November (5·27 and 19·5 per cent. respectively).

ARORA (G. L.) & PAJNI (H. R.). **Preliminary observations on the effect of mercury on** *Callosobruchus analis* **(F.).**—*Indian J. Ent.* **20** (1958) pt. 4 pp. 296–301, 6 refs. New Delhi, 1960.

In further tests in India on the insecticidal effect of mercury vapour on insect pests of stored products [*cf. R.A.E.*, A **37** 410, etc.], 1 lb. mung beans (*Phaseolus aureus* (*radiatus*)) was placed in a bottle of 500 cc. capacity, the insecticide was placed in filter paper in a muslin bag in the beans an inch from the top, and adults of *Callosobruchus analis* (F.) were released in the bottle. The results showed that infestation was completely prevented by 0·125 g. mercury, 0·25 g. zinc amalgam, 4 g. tin amalgam or 5 g. calomel (mercurous chloride), but smaller quantities permitted some of the eggs laid to hatch. The amalgams were prepared by melting zinc and tin, mixing them with mercury in the ratio of 7:10 and 1:1, respectively, and grinding.

Eggs and larvae were tested by exposing infested beans in a tube of 100 cc. capacity to 0·25 g. mercury. Exposure to mercury vapour killed all eggs 48–60 hours old in two hours, all eggs 12–24 hours old in six hours and all freshly laid eggs in four hours, but did not afford complete kill of older eggs. First- and second-instar larvae and pupae were killed by exposure to mercury vapour for 96–144 hours, but some early fourth-instar larvae survived after 192 hours. Immature stages surviving exposure showed delayed development.

GUPTA (R. L.). **Preliminary trial of bait-spray for the control of fruit-flies in India.**—*Indian J. Ent.* **20** (1958) pt. 4 pp. 304–306, 1 ref. New Delhi, 1960.

Dacus dorsalis Hend. is a serious pest of mangos in Uttar Pradesh, and the trees are visited, but not infested, by *D. cucurbitae* Coq. In tests in 1957, very promising control of both fruit-flies was given by bait-sprays of 0·75 oz. protein hydrolysate, 0·75 oz. sugar, 0·25 oz. 60 per cent. malathion emulsion concentrate and 1 gal. water, used at about 0·5 gal. per tree. Adults were attracted and killed within about 30 ft. on either side of a sprayed tree, and effectiveness was maintained, in the absence of rain, for 3–4 days.

AGARWAL (R. A.). *Aphrophora sigillifera* **Walker, on sugarcane near Coimbatore.**—*Indian J. Ent.* **20** (1958) pt. 4 pp. 310–311, 4 refs. New Delhi, 1960.

Aphrophora sigillifera Wlk., the food-plants of which in India had not previously been recorded, was found to be common on sugar-cane near Coimbatore in 1956 and 1957. Little damage resulted.

YANG (Hsui-yuan) & SHAW (Kang-you). **Preliminary studies on the peach borer,** *Dichocrocis punctiferalis* **Guénée.** [*In Chinese.*]—*Acta oecon.-ent. sin.* **1** no. 2 pp. 109–134, 14 figs., 17 refs. [Peking] 1958. (With a summary in English.)

Dichocrocis punctiferalis (Gn.), which also attacks peach, is the most injurious pest of sunflower (*Helianthus annuus*) in China, and observations on its bionomics and control were made in 1956–57. These showed that there are 4–5 generations a year, the larvae overwintering in the flowers, stems and fallen leaves, and that a spray of parathion afforded the best control.

CHANG (Tseh-pu), CHANG (Hwei-chien) & KAO (Chi-teh). **Investigation on the aphicidal effects of Systox applied to cotton seeds.** [*In Chinese.*]—*Acta oecon.-ent. sin.* **1** no. 2 pp. 144–151, 3 graphs, 16 refs. [Peking] 1958. (With a summary in English.)

Experiments in China in 1955 are described, showing that demeton (Systox) applied at suitable concentrations to cotton seeds before sowing protects the young plants from the cotton aphid [*Aphis gossypii* Glov.].

YOUNG (V. L.). **Studies on** *Pyrausta nubilalis* **Hübner in the western part of Hunan Province.** [*In Chinese.*]—*Acta oecon.-ent. sin.* **1** no. 2 pp. 165–174, 3 graphs. [Peking] 1958. (With a summary in English.)

Ostrinia (*Pyrausta*) *nubilalis* (Hb.) is an important pest of maize in western Hunan. It has 3–4 generations a year, the egg, larval and pupal stages lasting 4–7, 15–29 and 5–18 days, respectively. Recommendations for control are made.

SUN (Chen-yang), DU (I-lung) & LIAO (Yu-meh). **The preliminary studies on Chinese-***Citrus* **fly,** *Tetradacus citri* **Chen (Trypetidae, Diptera).** [*In Chinese.*]—*Acta oecon.-ent. sin.* **1** no. 2 pp. 175–187, 5 figs., 14 refs. [Peking] 1958. (With a summary in English.)

Dacus tsuneonis Miyake (*Tetradacus citri* (Chen)) causes severe losses of *Citrus* fruits in Szechwan and Kweichow. It has one generation a year, overwintering in the soil, and notes on its bionomics and control are given.

PENG (C. W.). **Biological notes on the bamboo-locust** (*Ceracris kiangsu* **Tsai) of Hunan, China.** [*In Chinese.*]—*Acta oecon.-ent. sin.* **1** no. 2 pp. 188–200, 10 figs., 18 refs. [Peking] 1958. (With a summary in English.)

An account is given of the bionomics of *Ceracris kiangsu* Tsai, a grasshopper that injures bamboo and various other plants in Hunan. It has one generation a year and overwinters in the egg.

JEN (I-sen) & LAI (Wen-chang). **A preliminary test on HCN fumigation for the control of several** *Citrus* **scales and two** *Citrus* **mites.** [*In Chinese.*]—*Acta ent. sin.* **9** no. 1 pp. 21–28, 2 figs., 8 refs. [Peking] 1959. (With a summary in English.)

Details are given of tests in China in which *Citrus* stocks were successfully fumigated with hydrogen cyanide for the control of *Icerya purchasi* Mask., *Ceroplastes rubens* Mask., *Leucodiaspis* (*Leucaspis*) *japonica* (Ckll.), *Aspidiotus destructor* Sign., *Pseudococcus citriculus* Green, *Eotetranychus* (*Tetranychus*) *sexmaculatus* (Ril.) and *Panonychus* (*Paratetranychus*) *citri* (McG.).

LEVENBOOK (L.). Ed. **Biochemistry of insects.**—*Proc. 4th int. Congr. Biochem. Vienna 1958* **12,** $9\frac{1}{4} \times 6$ in., xviii + 252 pp., illus., many refs. London, &c., Pergamon Press Ltd., 1959.

One of the symposia of the Fourth International Congress of Biochemistry held at Vienna in September 1958 concerned the biochemistry of insects, and the papers read are here presented, together with the discussions, the opening address and a report on the work. The papers include **The chemistry of host specificity of phytophagous insects,** by G. FRAENKEL (pp. 1–13, 29 refs.), in which knowledge of attractive and repellent chemical constituents of plants is reviewed; **Metabolism of silkworm in relation to biochemical virus**

induction, by K. Yamafuji (pp. 100–114, 1 pl., 3 figs., 2½ pp. refs.), in which work by the author and his colleagues on the induction of a polyhedral virus in silkworms (*Bombyx mori* (L.)) by treatment with chemicals is reviewed in connection with the metabolic reactions of the larval tissues; **Comparative aspects of insect biochemistry with particular reference to insecticidal action,** by F. P. W. Winteringham (pp. 201–210, 44 refs.); and **The metabolism of insecticides by insects,** by J. E. Casida (pp. 216–236, 3 pp. refs.), in which the main insecticides considered are DDT, BHC, pyrethrum and phosphorus compounds, metabolic routes are discussed, and the problem of acquired resistance is treated briefly.

Gabriel (B. P.). **Fungus infection of insects via the alimentary tract.**—*J. Insect Path.* **1** no. 4 pp. 319–330, 6 figs., 11 refs. New York, N.Y., 1959.

In comparative tests on the susceptibility of insects to fungi entering the alimentary tract, fewer infections were obtained when conidia of *Metarrhizium anisopliae* were administered to larvae of *Galleria mellonella* (L.), *Bombyx mori* (L.) and *Tenebrio molitor* L. by a micro-feeding technique than when they were applied to the integument. The trend was similar for *Beauveria bassiana* in *G. mellonella*, though variable in the other species, and it was found that germination of the conidia of the fungi in the intestinal contents was moderate or abundant for *G. mellonella* but not more than moderate for several other species tested, though generally abundant in the haemolymph.

Bird (F. T.). **Polyhedrosis and granulosis viruses causing single and double infections in the spruce budworm,** *Choristoneura fumiferana* **Clemens.**—*J. Insect Path.* **1** no. 4 pp. 406–430, 10 figs., 23 refs. New York, N.Y., 1959.

The following is based on the author's summary. The larvae of *Choristoneura fumiferana* (Clem.) are susceptible to a polyhedrosis virus that multiplies in the nuclei of the tracheal matrix, the fat and the hypodermal and blood cells [*cf. R.A.E.*, A **43** 302–303] and to a less virulent granulosis virus that multiplies in the cytoplasm of the same cells. In laboratory tests, prior infection with one virus interfered with infection by the other. In general, it appears that a cell will accept either virus, but not both. Adjacent cells are frequently infected with different viruses, but usually blocks of cells are infected with the same virus. The granulosis virus acts more slowly, and to produce a double infection an advantage must be given to it either in time or in the number of infectious units available. A cycle of development for polyhedrosis viruses based on an electron-microscope study of thin sections of cells in various stages of virus development is proposed.

Eslyn (W. E.). *Hemerocampa pseudotsugata* **McDunnough, a new host for** *Beauveria bassiana* **(Balsamo) Vuillemin.**—*J. Insect Path.* **1** no. 4 pp. 434–435. New York, N.Y., 1959.

Mummified pupae of *Hemerocampa pseudotsugata* McDunn. found on the undersurfaces of rocks in a forest region in New Mexico in March 1959 contained mycelium of *Beauveria bassiana*, and fruiting occurred when they were placed in a moist chamber.

STEINHAUS (E. A.). **Possible virus disease in European red mite.**—*J. Insect Path.* **1** no. 4 pp. 435–437, 1 fig. New York, N.Y., 1959.

Dead and moribund examples of *Panonychus ulmi* (Koch) collected from walnut trees in California in August 1955 and again in 1959 showed the presence of particles that were possibly of virus origin. They were not infective for healthy mites, possibly because the specimens used to prepare the inoculum had been dried for several days. A suspected virus has also been found in *P. citri* (McG.) in California.

SUTIĆ (M.). **Occurrence of a new sunflower disorder in Yugoslavia.**—*FAO Plant Prot. Bull.* **8** no. 11 pp. 129–131, 3 figs., 3 refs. Rome, 1960.

A disease of sunflowers (*Helianthus annuus*) became widespread in Yugoslavia in 1959. The symptoms resembled those recorded for the sunflower mosaic virus in the Soviet Union and in Argentina, where aphids have been found to act as vectors. *Aphis fabae* Scop., *A. euonymi* F., *A.* (*Cerosipha*) *gossypii* Glov. and *Anuraphis* (*Brachycaudus*) *helichrysi* (Kalt.) were present on the affected plants, and symptoms developed on healthy young plants to which they were transferred. When the aphids were destroyed, new symptoms ceased to develop and the plants recovered in two months. There was no evidence of a virus in these or in other tests.

Outbreaks and new records.—*FAO Plant Prot. Bull.* **8** no. 11 pp. 135–136, 1 ref. Rome, 1960.

It is reported from the U.S. Department of Agriculture (p. 136) that a single adult female of *Dacus dorsalis* Hend. was taken in a bait-trap on an orange tree in a grove at Anaheim, Orange County, California, during the week 24th–29th July 1960. This was the first record of the fruit-fly in the continental United States [*cf. R.A.E.*, A **38** 316]. Intensive trapping was instituted in the area, but no further examples had been taken by 29th August.

DAHM (P. A.) & others. **Field sampling of alfalfa for the estimation of Guthion residues.**—*J. econ. Ent.* **52** no. 5 pp. 791–798, 2 figs., 23 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. In tests in Iowa, a lucerne field was sprayed with 1 lb. azinphos-methyl (Guthion) per acre in a water emulsion, and a two-stage sampling scheme was used to obtain single, composite and cross-plot composite samples at intervals of 1, 3, 7, 14, 21 and 28 days after spraying. A total of 228 samples was taken on each sampling day, by methods described, and 100-g. portions of each were extracted by a procedure that yielded combined surface and internal residues. A decolorised benzene extract was ultimately obtained, and aliquots of this were used for colorimetric analyses and bioassays with females of *Musca domestica* L.

The data obtained by both analytical procedures and for the three types of sample were very similar. The weighted mean chemical residue values of single and composite samples were 51·5, 23·6, 8·7, 1·4, 0·2 and 0·2 parts per million, respectively, for samples gathered at the six intervals after spraying; because the residues were very low in the last three sets of samples, they could not be estimated accurately by bioassay, even though a fortifying procedure was used. The results indicated that with this sampling scheme and a uniform stand of lucerne, little, if any, advantage results from using composite rather than single samples to estimate mean residues. For practical purposes, a convenient combination for residue estimates involving more than one insecticide and rate of application would consist of collecting five subplot samples (either single or composite) selected from three plots.

Additional information was obtained on the variation in sample weights and moisture, sample processing and analytical procedures.

Guthrie (F. E.), Rabb (R. L.) & Bowery (T. G.). **Evaluation of candidate insecticides and insect pathogens for tobacco hornworm control, 1956–1958.**—*J. econ. Ent.* **52** no. 5 pp. 798–804, 7 refs. Menasha, Wis., 1959.

The following is based largely on the authors' abstract. In view of objections to the presence of insecticide residues on tobacco, materials that might be used against *Protoparce sexta* (Joh.) without leaving heavy residues were tested in North Carolina in 1956–59. Laboratory tests of contact toxicity to the larvae indicated that azinphos-methyl (Guthion) and dichlorvos (DDVP) were equally effective and more so than endrin, trichlorphon (Dipterex) or Shell SD 4402 (1,3,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanophthalan), which did not differ from one another; Thiodan and Sevin were less effective, but more so than Chlorthion, Delnav (2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)), ethion and Trithion.

In field tests of sprays applied at 40–50 U.S. gal. per acre, 0·8, 0·8, 0·2 and 1 lb. Thiodan, Sevin, SD 4402 and trichlorphon, respectively, controlled the larvae about as well as 0·4 lb. endrin, whereas azinphos-methyl gave poorer results at 0·2 lb., but was effective at 1 lb. per acre. All materials were about equal in reducing damage when estimates were made nine days after treatment, but azinphos-methyl and trichlorphon permitted more damage than the other materials after 22 days. The residues from the compounds dissipated to the extent of 85 per cent. or more during flue-curing, and none affected the taste of the cured tobacco except Sevin, which caused a slight off-flavour.

Sprays of *Bacillus thuringiensis* were as effective as endrin in preventing damage by *P. sexta*, although less effective initially in reducing larval populations, and had no detrimental effect on colonies of *Polistes exclamans* Vier., which preys on the larvae. Two commercial preparations of *B. thuringiensis* were found to be as effective as insecticides in preventing damage.

Madsen (H. F.) & Bailey (J. B.). **Control of** *Sanninoidea exitiosa graefi* **(Hy. Edw.) on apricots.**—*J. econ. Ent.* **52** no. 5 pp. 804–806, 10 refs. Menasha, Wis., 1959.

In northern California, *Aegeria* (*Sanninoidea*) *exitiosa graefi* (Edw.) attacks various stone fruits, but is most injurious to apricot, and its control on this tree was investigated in 1955–58. The results were evaluated first by caging the trees to trap emerging adults, later by counting empty cocoons or pupal cases and finally by counting sites of attack on the trunks in the early autumn, the last of which methods was the easiest.

In tests of fumigants, applied to the soil round the trees on 2nd November 1955, tetrachloroethane injected at 4 oz. per tree caused the greatest reduction in moth emergence in 1956, but was very phytotoxic, 1 oz. p-dichlorobenzene and 0·5 U.S. pint 20 per cent. propylene-dichloride emulsion, applied to the surface and immediately covered with soil, gave good control, and 0·5 U.S. pint 20 per cent. ethylene-dichloride emulsion was less effective.

In 1957, spraying the trunks from the main branches to soil level with 0·8 lb. endrin in an emulsion concentrate or with 8 lb. 25 per cent. wettable Thiodan per 100 U.S. gal. on 29th May, 28th June and 2nd August gave very good control and spraying with 8 lb. 50 per cent. wettable DDT on these dates or only on 29th May and 2nd August good commercial control, with little difference between treatments, whereas an application of whitewash on 29th May was ineffective. In 1958, treatment with 2 lb. Thiodan or 0·8 lb. endrin per 100 U.S. gal. emulsion spray twice, on 15th May and 25th July, or four times, on these dates and 18th June and 18th August, gave excellent control, as also did four applications of 8 lb. 25 per cent. wettable azinphos-methyl (Guthion), but two applications of azinphos-methyl and four of 8 lb. 50 per cent. wettable DDT were less effective, though they gave commercial control, and a single application of 1·5 lb. dieldrin in 100 U.S. gal. emulsion spray on 15th June was unsatisfactory.

MISTRIC jr. (W. J.) & SPYHALSKI (E. J.). **Response of cotton and cotton pests to Thimet seed-treatment.**—*J. econ. Ent.* **52** no. 5 pp. 807–811, 2 graphs, 9 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. When cotton seed, treated with 4 lb. 44 or 50 per cent. or 8 lb. 44 per cent. phorate (Thimet) on activated carbon per 100 lb. seed, was sown in four widely separated areas in North Carolina in 1955–56, the treatments were very effective in controlling *Frankliniella fusca* (Hinds), *F. exigua* Hood, *F. tritici* (Fitch), *Thrips tabaci* Lind. and *Aphis gossypii* Glov. until squares developed and gave seasonal protection from *Tetranychus cinnabarinus* (Boisd.) and *T. telarius* (L.). They reduced infestations by *Anthonomus grandis* Boh. throughout the season, but favoured the development of *Heliothis zea* (Boddie) and *H. virescens* (F.). Delayed fruiting of the cotton appeared to be the most detrimental result, but there were also adverse effects on germination, seedling emergence and plant growth.

STEINHAUER (A. L.), DITMAN (L. P.) & WILEY (R. C.). **Insecticidal control of insects infesting broccoli and cabbage.**—*J. econ. Ent.* **52** no. 5 pp. 816–818, 1 ref. Menasha, Wis., 1959.

In tests on the control of *Trichoplusia ni* (Hb.), *Pieris rapae* (L.) and *Brevicoryne brassicae* (L.) in Maryland in 1958, insecticides were applied at weekly intervals to cabbage in July–September and to broccoli in August–October, in 25 U.S. gal. emulsion spray per acre for early treatments and in 50 U.S. gal. for later ones; all insecticide quantities given are per acre, and the following is based largely on the authors' abstract of the paper.

The most promising treatments against all three insects were sprays of 1 lb. dimethoate alone or 2 lb. malathion, alone or with 2 lb. ethyl-DDD (Perthane) or 3 lb. toxaphene. Sprays of 1 lb. Dibrom (dimethyl, 1,2-dibromo-2,2-dichloroethyl phosphate), 0·5 lb. Thiodan and 1 lb. ethyl-DDD with 0·5 lb. diazinon or 1 lb. Trithion, which were not tested on cabbage, gave good protection on broccoli. Azinphos-methyl (Guthion), Delnav [2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)], Kepone [2,3,3a,4,5,6,7,7a,8,8-decachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene-1-one] (here defined as 1,2,3,5,6,7,8,9,10,10-decachlorotetracyclo[5.2.1.$0^{2.6}$.$0^{3.9}$.$0^{5.8}$]decan-4-one) and Kepone with malathion did not control the aphid satisfactorily, and Am.Cyanamid 18706 (O,O-dimethyl S-ethylcarbamoylmethyl phosphorodithioate), Delnav, phosphamidon and malathion were ineffective against *T. ni*. All the compounds caused some scorching of broccoli in mid-September, but the damage had disappeared by harvest.

Thomas (H. A.), Specht (H. B.) & Driggers (B. F.). **Arthropod fauna found during the first-season trial of a selective spray schedule in a New Jersey apple orchard.**—*J. econ. Ent.* **52** no. 5 pp. 819–820, 6 refs. Menasha, Wis., 1959.

The observations described were made in 1957 in an apple orchard in southern New Jersey, in which the trees were sprayed with 0·5 U.S.pint demeton per 100 U.S.gal. at the pink stage, with 2·5 lb. lead arsenate per 100 U.S.gal. at the petal-fall stage and 10 and 20 days later, and with 5 lb. ryania per 100 U.S.gal. at the time of the last lead-arsenate spray and at ten-day intervals in all cover sprays. Glyodin was included in all sprays in one block and in all but four intermediate ones, in which it was replaced by captan, in the other. DDT had been used in previous years.

Weekly sampling of leaves showed that *Panonychus ulmi* (Koch) was the only phytophagous mite of importance; *Tetranychus telarius* (L.) was found occasionally, but did not increase during the season. Incipient outbreaks of mites were controlled by a species of *Chrysopa* and by *Stethorus punctum* (Lec.), predacious mites of the genera *Mediolata* and *Typhlodromus* having very little effect until towards the end of the season, when they were mainly responsible for control. Examination of the fruits at the end of the season showed that 4–9 per cent. were damaged by *Conotrachelus nenuphar* (Hbst.), about 2 per cent. by *Argyrotaenia velutinana* (Wlk.), 1·8–2·8 per cent. by *Cydia* (*Carpocapsa*) *pomonella* (L.) and a negligible proportion by other pests.

It is concluded that treatment with glyodin and ryania gives acceptable control of *C. pomonella* and satisfactory control of mites, and that predacious arthropods known to reduce mite populations appear within one season of the discontinuance of DDT sprays.

Long (W. H.), Concienne (E. J.), Hensley (S. D.), McCormick (W. J.) & Newsom (L. D.). **Control of the sugarcane borer with insecticides.**—*J. econ. Ent.* **52** no. 5 pp. 821–824, 5 refs. Menasha, Wis., 1959.

In tests in Louisiana in 1956–58, good control of *Diatraea saccharalis* (F.) on sugar-cane and good increases in yield were obtained from 2 per cent. endrin granules, broadcast by aeroplane at about 12 lb. per acre four times fortnightly or eight times at weekly intervals, with no significant difference between treatments, but similar applications of a 2 per cent. endrin dust were not always effective, and ryania in 40 per cent. dust or granules, though giving control and increasing yield, was less effective than endrin against *D. saccharalis*. In a small-plot test in 1958, treatment with 5 per cent. DDT granules increased the losses due to *D. saccharalis*, 5 per cent. Sevin, heptachlor or Trithion granules were less effective than 2 per cent. endrin granules, and 5 per cent. Thiodan granules were comparable with endrin.

GARMAN (P.). **Experiments in apple insect control.**—*J. econ. Ent.* **52** no. 5 pp. 826–828. Menasha, Wis., 1959.

In tests in Connecticut in 1957–58, 11 combinations of insecticides and fungicides were applied to apple trees and evaluated for control of insects and diseases, quality of fruit, safety and cost. It was found that 2 lb. azinphos-methyl (Guthion) with 1·5 lb. captan per 100 U.S. gal. gave the best results, followed in order by mixtures of 2 lb. Sevin, 1·5 lb. Kelthane and 1·5 lb. captan, 3 lb. methoxy-DDT (methoxychlor), 2 U.S. pints glyodin and 1·5 lb. ferbam, and 3 lb. lead arsenate, 2 lb. malathion and 1·5 lb. captan; a mixture of 2 lb. Kepone (2,3,3a,4,5,6,7,7a,8,8-decachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene-1-one, also known as Compound 1189) with 1·5 lb. captan, which was tested only in 1958, gave very promising results.

Of the insecticides tested, azinphos-methyl and Sevin proved to be good general toxicants with few drawbacks. Kepone seemed more effective than ryania, which was inadequate in the test area, and was no more destructive to beneficial insects. Lead arsenate was reasonably effective, except against *Hoplocampa testudinea* (Klug), *Typhlocyba pomaria* McAtee, aphids and mites, and the addition of malathion did not prevent damage by these. Methoxy-DDT gave good results against *Conotrachelus nenuphar* (Hbst.), and ethion and Delnav [2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)] did not give adequate general control, but may prove useful against single species.

JOHNSON (N. E.). *Pineus* **infestation on true firs in western Washington.**—*J. econ. Ent.* **52** no. 5 pp. 828–829, 2 figs., 7 refs. Menasha, Wis., 1959.

An unidentified species of the genus *Chermes* (*Pineus*) was observed on *Abies amabilis* and *A. grandis* in Lewis County, Washington. It attacks the bole and branches, but causes little apparent damage. Because of its similarity to *C. piceae* Ratz., which is considered the most serious pest of firs in the Pacific Northwest [*cf. R.A.E.*, A **48** 337, etc.], characters are described by which they can be separated under low magnification.

STRONG (R. G.), OKUMURA (G. T.) & SBUR (D. E.). **Distribution and host range of eight species of** *Trogoderma* **in California.**—*J. econ. Ent.* **52** no. 5 pp. 830–836, 8 maps, 17 refs. Menasha, Wis., 1959.

The following is substantially the authors' abstract. Maps are given showing the distribution of *Trogoderma glabrum* (Hbst.), *T. granarium* Everts, *T. grassmani* Beal, *T. inclusum* Lec., *T. ornatum* (Say), *T. parabile* Beal, *T. simplex* Jayne and *T. sternale* Jayne in California. They are based on the records of the California Khapra Beetle Survey, but the authors note that most infestations of *T. granarium* had been eradicated and that the remainder would probably have been treated [*cf. R.A.E.*, A **45** 259] by the time the paper was published.

Of 132 stored products listed from the survey reports, *T. glabrum*, *T. granarium*, *T. grassmani* and *T. inclusum* were found in association with 6, 37, 13 and 33, respectively, and *T. ornatum*, *T. parabile*, *T. simplex* and *T. sternale* with 20, 77, 60 and 79. Preliminary food tests with *T. granarium* and *T. parabile* in the laboratory are recorded, and the known food habits of *T. granarium* are summarised from published reports.

The need for detailed investigations is apparent from the distribution and broad food associations recorded for the eight species in California and from the general lack of information on *Trogoderma* spp. as storage pests in the United States.

Ridgway (R. L.) & Gyrisco (G. G.). **Control of insects injurious to birdsfoot trefoil in New York.**—*J. econ. Ent.* **52** no. 5 pp. 836–838, 3 refs. Menasha, Wis., 1959.

Insecticides were applied alone or in combination in 20 U.S. gal. emulsion spray per acre for the control of insects injurious to birdsfoot trefoil (*Lotus corniculatus*), grown for hay and seed in New York in 1958. When applied on 20th June against *Sparganothis xanthoides* (Wlk.), which feeds extensively and webs the terminals and flowers, mevinphos (Phosdrin) and parathion at 0·5 lb. per acre gave outstanding results, the latter being the more economical in use. A spray of 0·25 lb. lindane [almost pure γ BHC] per acre on 17th May gave excellent control of *Philaenus leucophthalmus* (L.), and one of 1 lb. Thiodan on 16th June gave effective control of *Lygus lineolaris* (P. de B.); forage and seed yields were increased significantly by either treatment alone and by larger amounts on plots receiving both. When applied on 17th June to trefoil that had been treated with toxaphene against *P. leucophthalmus* in early spring and was just beginning to bloom, 1 lb. parathion or aldrin per acre caused a significant increase in yield, as determined by counts of mature plants on 2nd August, and 0·25 lb. endrin and 1 lb. malathion resulted in considerable increases, though they could not be proved significant owing to variations in stand.

Harrison (F. P.), Coan (R. M.) & Ditman (L. P.). **Experiments on the control of fall armyworm in sweet corn.**—*J. econ. Ent.* **52** no. 5 pp. 838–840, 2 refs. Menasha, Wis., 1959.

In tests in Maryland in 1957, 1–5 weekly applications of 7·5 per cent. DDT granules at 20 lb. per acre, beginning on 15th August, did not give satisfactory control of *Spodoptera* (*Laphygma*) *frugiperda* (J. E. Smith) on sweet maize. In 1958, 2–3 similar applications in late July and early August gave better control of the larvae, but had no effect on yield, ear size or proportion of marketable ears. When 1 U.S. quart 25 per cent. DDT emulsion concentrate was applied in 25–50 U.S. gal. spray per acre on 2nd and 15th August, the more dilute spray caused slightly greater reductions in larval population than the more concentrated one.

Hightower (B. G.). **Bioassays of weathered residues of several organophosphorus insecticides.**—*J. econ. Ent.* **52** no. 5 pp. 840–842, 2 refs. Menasha, Wis., 1959.

In laboratory tests in Texas, residues from emulsion sprays of azinphos-methyl (Guthion), malathion and methyl-parathion on cotton plants were exposed to natural or simulated weather conditions and tested for toxicity to *Anthonomus grandis* Boh. as in previous work [*cf. R.A.E.*, A **48** 27]. The toxicity of azinphos-methyl was not affected by high natural light intensity (maximum 13,000 foot-candles) at temperatures above 100°F., but was reduced by 0·5 in. simulated rain. That of malathion and methyl-parathion was not affected by high temperature in the absence of bright sunlight, but was reduced by the addition of high light intensity; these materials were not exposed to rain. The addition of 2 lb. toxaphene to a spray of 0·5 lb. malathion per acre did not reduce the effect of exposure for 24 hours to outdoor conditions of temperature, humidity and light on the toxicity of the residue, but its addition to 0·25 lb. malathion resulted in considerably higher kills than those from this material alone, and it is concluded that organophosphates and chlorinated hydrocarbons can be combined to increase the toxicity of the residue to *A. grandis*.

CONRAD (M. S.). **The spotted lady beetle,** *Coleomegilla maculata* **(De Geer), as a predator of European corn borer eggs.**—*J. econ. Ent.* **52** no. 5 pp. 843–847, 4 figs., 18 refs. Menasha, Wis., 1959.

In view of the relative abundance of *Ceratomegilla* (*Coleomegilla*) *maculata* (Deg.) and its frequent presence on maize, its effect as a predator of the eggs of *Ostrinia* (*Pyrausta*) *nubilalis* (Hb.) was investigated in Delaware in 1957–58. The Coccinellid was found to overwinter in sheltered places in the adult stage and was common on weeds in early spring, on clover and lucerne in late spring, and on all crops during the summer, but larvae were found only on clover and lucerne or on maize infested by aphids. There appeared to be 4–5 generations a year, and the adults were parasitised by *Perilitus coccinellae* (Schr.).

The eggs are apparently laid only near aphid colonies, and larvae were never found on maize until it was infested by *Rhopalosiphum maidis* Fitch. They did not move in search of other food until the aphid colonies had been largely destroyed, and so rarely fed on *O. nubilalis*. In a cage test, an adult consumed nearly 60 eggs of *O. nubilalis* a day for 13 days, regardless of variations in temperature or rainfall, but fed on them only when they were on the leaves of maize beyond the seedling stage and seldom destroyed the whole of a large batch. Collection of faecal pellets on cards coated with adhesive and hung under 436 egg-masses of *O. nubilalis* on maize plants indicated that the Coccinellid fed on 16·5 and 15·3 per cent. of the masses, respectively, in two fields.

HENSON (W. R.) & STARK (R. W.). **The description of insect numbers.**—*J. econ. Ent.* **52** no. 5 pp. 847–850, 2 figs., 10 refs. Menasha, Wis., 1959.

The authors discuss the terms commonly used to describe the size of populations of phytophagous insects and the confusion as to their exact meaning, in view of the different relations between species and their food-plants. They distinguish three general categories of population, namely, tolerable ones, which do not use up the entire excess biological productivity of the food-plant, critical ones, which use more than the excess biological productivity but less than the total productivity, and intolerable ones, which deplete the food-plant at a rate greater than the current rate of production. These are illustrated from the relations between lodgepole pine (*Pinus contorta*) and the needle-miner, *Recurvaria starki* Freeman, in Canada [*cf.* *R.A.E.*, A **47** 86].

FINLAYSON (D. G.), CROWELL (H. H.), HOWITT (A. J.), SCOTT (D. R.) & WALZ (A. J.). **Chemical control of the onion maggot in onions grown from seed in various types of soil in northwestern North America in 1955 and 1956.**—*J. econ. Ent.* **52** no. 5 pp. 851–856, 2 graphs, 12 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. Tests made in 1955 showed that dieldrin, heptachlor and isodrin, applied as wettable powders to the moistened seed or as dusts or emulsions to the furrows with the seed, gave economic control of *Hylemyia antiqua* (Mg.) on onion under irrigated conditions in the interior of British Columbia and Idaho, but that malathion similarly applied had no effect. In western Washington and western Oregon, neither dieldrin nor heptachlor gave economic control, but isodrin and malathion, applied in all three ways, warranted further investigation. In three of the areas, fewer seedlings emerged where the insecticides were applied in emulsion as drenches to the seed furrow than where the other treatments were used, but in the fourth this difference was not so apparent.

In similar experiments in 1956, furrow and seed treatments with dieldrin, endrin and heptachlor allowed 0·8 per cent. plant damage in a sandy clay loam and 5·1 per cent. in a peat soil in the interior of British Columbia, but malathion gave no protection. In muck soil in western Oregon, there was 47·3 per cent. damage in untreated plots and 4·2–7·7 and 5·7–14·4 per cent. after treatment with malathion and endrin, respectively. These results indicate that soil types or conditions influence the effectiveness of the insecticides. In western Washington and Idaho, none of the treatments was satisfactory in 1956, damage in treated fields ranging from 75 to 100 and from 37 to 71 per cent., respectively, and this suggests that strains of *H. antiqua* resistant to insecticides were developing.

Riehl (L. A.), LaDue (J. P.) & Rodriguez jr. (J. L.). **Efficiency of ethion in oil spray against California red scale and citrus red mite.**—*J. econ. Ent.* **52** no. 5 pp. 857–860, 12 refs. Menasha, Wis., 1959.

The following is based largely on the authors' abstract. In southern California, where numerous pests have to be controlled on *Citrus*, sprays of oil emulsion, often with the addition of toxicants, are commonly timed to give combined control of *Panonychus citri* (McG.) and *Aonidiella aurantii* (Mask.). In laboratory tests, combinations of ethion with kerosene or medium-grade spray oil in emulsion sprays were compared with those of malathion and these oils against the eggs of the mite and adult females of the scale.

In a non-toxic kerosene emulsion, malathion was ineffective against the eggs of the mite and ethion very effective against eggs of a non-resistant strain but much less so against those of a strain resistant to organophosphates, for which the LD95 was more than 15 times as great. Malathion was more effective than ethion against *A. aurantii*. For a given concentration of ethion, effectiveness against the scale varied directly with the concentration of kerosene, but that against mite eggs of the non-resistant strain was not affected, except at concentrations below 1 pint per 100 gal., at which there seemed to be a reduction in efficiency.

When added to a spray of the medium-grade oil that would give high but not complete mortality, ethion and malathion gave comparable improvement of kill against the scale and nullified the variation in effectiveness of the unsupplemented oil deposit, which was in inverse proportion to the density of the population. Both materials in oil emulsion were completely effective against the crawlers, which settled and survived the effects of oil alone. The selected dosage of oil was equally effective against resistant and non-resistant mite eggs, but for a comparable increase in kill, eight times as much ethion was required for resistant as for non-resistant mite eggs. Ethion was more effective than malathion against the mite.

Oatman (E. R.). **European red mite control and population studies on apple in Wisconsin.**—*J. econ. Ent.* **52** no. 5 pp. 871–877, 5 figs., 17 refs. Menasha, Wis., 1959.

The following is substantially the author's abstract. Genite, chlorbenside (Mitox) and chlorfenson (ovex), applied in pre-blossom sprays, controlled *Panonychus ulmi* (Koch) throughout the season on apple in Door County, Wisconsin, in 1956 and 1957. Aramite (2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite), chlorobenzilate, demeton, kelthane and chlorbenside, used as summer foliar sprays, reduced the mite to low levels for the remainder of the season.

P. ulmi had five generations in 1956 and 1957 and four in 1958, and the population normally reached its highest peak at the end of July and then abruptly declined. The first summer eggs were laid by blossom time, and overwintering eggs in the first week of August; the highest numbers were produced by adults of the first summer generation. Populations on treated trees exceeded those on untreated ones at the beginning of September, remained at a higher level until the end of the season and produced more overwintering eggs, the numbers of these being proportional to the degree of control obtained [*cf. R.A.E.*, A **47** 342]. In 1958, populations from overwintering eggs were higher and reached peaks earlier in plots that had been treated in 1957 than in those that had not. *Typhlodromus* mites, the only predators observed, were very scarce on untreated plots in 1956 and 1957, but more numerous in 1958, when they were present in the first week of July, gradually increased in numbers and surpassed the population of *P. ulmi* by mid-August; *T. fallacis* (Garman) comprised at least 95 per cent. of the population and *T. finlandicus* (Oudm.) the remainder.

Hall (I. M.) & Andres (L. A.). **Field evaluation of commercially produced** *Bacillus thuringiensis* **Berliner used for control of Lepidopterous larvae on crucifers.**—*J. econ. Ent.* **52** no. 5 pp. 877–880, 2 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. Preliminary tests having shown that various Lepidopterous larvae found on cruciferous crops are susceptible to infection by *Bacillus thuringiensis* [*cf. R.A.E.*, A **47** 323, etc.], commercially prepared samples of spore material were tested on cauliflower and cabbage in the field in California in 1958. It was found that sprays did not give sufficiently good coverage and that dusts gave no control of *Spodoptera* (*Laphygma*) *exigua* (Hb.). A minimum dosage of 25×10^{12} spores per acre was required to give 80 per cent. kill of *Trichoplusia ni* (Hb.) and *Pieris rapae* (L.), and it is likely that doses of up to 68×10^{12} spores per acre may be necessary for adequate control in some situations. The materials lost their effectiveness on the plants after 5–10 days, so that repeated applications may be necessary.

Flanders (S. E.). *Pseudococcus citriculus* **Green and its parasites.**—*J. econ. Ent.* **52** no. 5 pp. 880–882, 16 refs. Menasha, Wis., 1959.

The following is based largely on the author's abstract. The *Citrus*-infesting mealybug, *Pseudococcus citriculus* Green [*cf. R.A.E.*, A **10** 541; **27** 616; **37** 113], has frequently been misidentified as the very similar *P. comstocki* (Kuw.) [*cf.* **28** 270, 372; **29** 167, 168, etc.], which is not known to reproduce on *Citrus*. *P. citriculus* is widely distributed in eastern Asia and appears in certain regions to be prevented from rising above low densities by insect parasites [*cf.* **22** 67; **25** 596, etc.]. Some of the parasites released against *Planococcus citri* (Risso) in California before 1920 were from *Pseudococcus citriculus*, and the latter breeding on *Citrus* and *Pandanus* in Hong Kong was found in 1950 to be parasitised by *Coccophagus pseudococci* Comp. The life-history of this Aphelinid resembles that of *C. gurneyi* Comp. [*cf.* **24** 664, etc.]. Females developed from eggs laid by mated females in *Planococcus citri*; and males from the eggs of unmated females laid in examples of this mealybug that already contained eggs of *Pauridia peregrina* Timb. or in *Pseudococcus citriculus* parasitised by females of *C. pseudococci*;

the male hatched and developed as a hyperparasite after the primary parasite had consumed the host contents. The continuing successful control of *P. citriculus* on *Citrus* in Israel by *Clausenia purpurea* Ishii [*cf.* **30** 24, 508; **41** 229] may be dependent on the absence of the hyperparasite, *Lygocerus* sp. [*cf.* **36** 410].

Riehl (L. A.) & Wedding (R. T.). **Effects of naphthenic and paraffinic petroleum composition at a comparable molecular weight or viscosity on photosynthesis of Eureka lemon leaves.**—*J. econ. Ent.* **52** no. 5 pp. 883–884, 4 refs. Menasha, Wis., 1959.

The following is substantially the authors' abstract. Experiments to compare the effects of naphthenic and paraffinic composition of saturated, narrow-cut petroleum fractions at comparable levels of molecular weight or of viscosity in oil emulsions on the apparent photosynthesis in lemon leaves were carried out in California by methods already described [*R.A.E.*, A **48** 220]. At a deposit level comparable with that from field dosage, the difference in paraffinicity had no evident effects at molecular weights of 306 and 308 or a viscosity of 70 S.S.U. For heavy oil deposits, indicative of the situation in oil-soaked tissue, initial inhibition of photosynthesis was about the same, but recovery was faster in plants treated with naphthenic than with paraffinic oil of comparable molecular weight or viscosity. The difference in rate of recovery associated with difference in paraffinicity was greater for oils of comparable viscosity than for those of comparable molecular weight.

Stermer (R. A.). **Spectral response of certain stored-product insects to electromagnetic radiation.**—*J. econ. Ent.* **52** no. 5 pp. 888–892, 3 figs., 8 refs. Menasha, Wis., 1959.

The following is based largely on the author's abstract. In order to evaluate the light-trap as a tool for the early detection of stored-product insects or for control, laboratory tests were carried out to determine the response of seven species to nine wavebands of light ranging in length between 280·4 and 600 mμ. It was found that *Cadra* (*Ephestia*) *cautella* (Wlk.), *Sitotroga cerealella* (Ol.), *Rhyzopertha dominica* (F.) and *Tribolium castaneum* (Hbst.) preferred a waveband with a peak near 500 mμ, in the green portion of the spectrum, and *Plodia interpunctella* (Hb.) one between 334 and 365 mμ, in the ultraviolet region. *Sitophilus oryzae* (L.) showed no preference, but generally migrated to light of all wave-lengths between 334 and 546 mμ, and *Cryptolestes pusillus* (Schönh.) (*Laemophloeus minutus* (Ol.)) did not react in sufficient numbers to give significant results. Males were generally attracted in greater numbers than females. The reaction of all the species was increased significantly by an increase in light intensity, but this generally caused no change in the waveband preferred.

Waterhouse (J. S.). **A laboratory method for evaluating the toxicity of insecticides to the garden Symphylid,** *Scutigerella immaculata* **(Newport).**—*J. econ. Ent.* **52** no. 5 pp. 892–895, 3 graphs, 2 refs. Menasha, Wis., 1959.

The method described was developed to reduce the time spent in comparing the results obtained against *Scutigerella immaculata* (Newp.) in field-plot tests. Sand (pH 7) was mixed with an acetone solution of insecticide, dried and levelled over the surface of moist plaster of paris in a stender dish. A few drops of distilled water were added, which hardened the surface after further slight drying. Individuals of all feeding instars and both sexes were introduced, the dishes were covered and kept at constant temperature and humidity, and mortality counts were made after 24, 48 or 72 hours; moisture from the plaster of paris below the sand prevented desiccation. Tests with parathion, malathion and aldrin showed a much higher degree of toxicity for parathion than for the other two materials, in accordance with field results [*cf. R.A.E.*, A **44** 162; **48** 465], with no apparent difference in susceptibility between sexes and instars.

OATMAN (E. R.). **Natural control studies of the melon leaf miner,** ***Liriomyza pictella*** **(Thomson).**—*J. econ. Ent.* **52** no. 5 pp. 895–898, 2 graphs, 11 refs. Menasha, Wis., 1959.

In the course of studies on *Liriomyza pictella* (Thoms.) in California [*cf. R.A.E.*, A **48** 511], investigations were made on its natural control. A detailed study of the number and species of parasites found in random samples of mined melon leaves taken at intervals of 1–2 weeks during the seasons of 1954 and 1955 showed that parasitism increased as the crop matured, with the parasite population below that of the host early in the season, further below it during the middle of the growing period and above it as the plants approached senescence. Parasites therefore appeared not to be the only factor in the reduction of the population. Treatment of the plants with DDT or parathion depressed the populations of host and parasites, but had a less persistent effect on the former, permitting it to increase in numbers more rapidly than its parasites. At least 19 species of Hymenoptera were reared from the larvae and pupae of *L. pictella*, the most numerous being *Solenotus begini* (Ashm.) and *Halticoptera aenea* (Wlk.), and it is concluded that the Agromyzid is heavily parasitised in nature and that the use of chlorinated insecticides on melon has interfered with natural control.

NEUNZIG (H. H.) & GYRISCO (G. G.). **Parasites associated with seed Chalcids infesting alfalfa, red clover, and birdsfoot trefoil seed in New York.**—*J. econ. Ent.* **52** no. 5 pp. 898–901, 18 refs. Menasha, Wis., 1959.

The name *Bruchophagus gibbus* (Boh.) is commonly applied to Eurytomids that feed on the seeds of lucerne (*Medicago sativa*), red clover (*Trifolium pratense*) and birdsfoot trefoil (*Lotus corniculatus*), but evidence indicates that three species, each restricted to a single genus of plants, are involved [*cf. R.A.E.*, A **47** 339]. Parasites that occurred in association with the Eurytomids were reared from seed collected at numerous localities throughout New York over a period of four years and were found to comprise *Tetrastichus bruchophagi* Gah. and *Habrocytus medicaginis* Gah. from infested seed of all three species, *Mesopolobus* (*Amblymerus*) *bruchophagi* (Gah.) and *Eupelmella vesicularis* (Retz.) from lucerne and birdsfoot trefoil, and *Liodontomerus longfellowi* (Gir.), *L. perplexus* Gah. and *Eupelmus allynii* (French) only from red clover, lucerne and birdsfoot trefoil, respectively. *Eupelmella* and *Eupelmus* were reared in relatively small numbers from samples yielding numerous other parasites and may have been acting as hyperparasites.

Al-Azawi (A. F.) & Norris jr. (D. M.). **Experimental prevention of bark beetle transmission of *Ceratocystis ulmi* (Buis.) Moreau with the systemic insecticide Chipman R-6199.**—*J. econ. Ent.* **52** no. 5 pp. 902–904, 1 graph, 2 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. The implantation of 10, 20 or 30 g. amiton oxalate (Chipman R-6199) in the trunks of elms [*cf. R.A.E.*, A **48** 118] in Wisconsin in May 1958 prevented the transmission of *Ceratocystis ulmi*, the fungus that causes Dutch elm disease, by groups of young adults of *Scolytus multistriatus* (Marsham) caged on them for a week at weekly intervals from 20th May to 1st August. Successful transmission to untreated trees, which occurred only from beetles caged on 20th and 29th May and 4th and 10th June, caused 30 per cent. to show symptoms of the disease. The mean length of the feeding niches of the beetles was 1·5 mm. or less in treated trees and 3·3 mm. or more in untreated ones. In diseased trees, the smallest niche that penetrated at least to the cambium was 3 mm. long, and this appears to be the minimum length for successful infection of the tree through terminal twigs. On the basis of this limited knowledge, it is calculated that 96·3 per cent. reduction in the number of niches suitable for fungus inoculation resulted from the treatment. At 20 g. per tree, the insecticide reduced the length of the feeding niches for the 80 days of observation, and it is concluded that the treatment gives protection against transmission of the fungus throughout the important period of spring and early summer.

Lavigne (R.). **Biology of *Philaenus leucophthalmus* (L.), in Massachusetts.**—*J. econ. Ent.* **52** no. 5 pp. 904–907, 1 graph, 8 refs. Menasha, Wis., 1959.

Surveys showed that *Philaenus leucophthalmus* (L.) is present throughout Massachusetts. Seven of the eight North American varieties of the Cercopid were found. These are recorded according to their abundance, and 17 previously unreported food-plants are listed. The bionomics of the Cercopid are discussed, and it is concluded that hatching begins when the number of accumulated day-degrees above 50°F., beginning on 1st April, reaches 75 ± 3, and confirmed that the number of nymphs per stem can be estimated from the proportion of infested stems. About 17 per cent. of the lucerne fields surveyed in 1957 could be regarded as sufficiently infested to warrant treatment, if an average of 0·5 nymph per stem is taken as the criterion of economic importance.

Hofmaster (R. N.). **Effectiveness of new insecticides on the potato leafhopper and the influence of leafhopper control and potato variety on tuberworm infestations.**—*J. econ. Ent.* **52** no. 5 pp. 908–910, 4 refs. Menasha, Wis., 1959.

Empoasca fabae (Harris) normally causes comparatively little damage to the spring crop of potatoes on the Eastern Shore of Virginia, but reduced yields by up to 50 per cent. in 1957. The attack occurred in the month before harvest, when regular control programmes had been largely discontinued as infestation by *Epitrix cucumeris* (Harris) was very light, and it was favoured by the poor condition of the plants, resulting from drought, and the substitution of dieldrin for DDT, to which *E. cucumeris* and *Leptinotarsa decemlineata* (Say) had shown resistance. Investigations were therefore made in

1957–58 to find a better all-round insecticide, and the following is based on the author's abstract of the results.

Four weekly applications of 0·2 lb. Delnav [2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)], Sevin or Thiodan in 100 U.S. gal. spray per acre caused 98 per cent. reduction in *Empoasca* seven days after the last application. Ethion, trithion and azinphos-methyl (Guthion) gave good results at 0·5 lb. per acre, and 0·5 lb. diazinon, Dibrom (dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate), trichlorphon (Dipterex), parathion and mevinphos (Phosdrin) gave high initial mortality, but had only a limited residual action. DDT at 0·5 lb. per acre was quite effective, but inferior to Sevin, Thiodan or a mixture of DDT and Dibrom, and aldrin, dieldrin and heptachlor did not give adequate control. All the insecticides were used as emulsion concentrates except trichlorphon, which was in a soluble powder, and azinphos-methyl, which was in a wettable one.

Observations in commercial plantings showed that damage by *Gnorimoschema operculella* (Zell.) to tubers in the soil was affected by the degree of control of *Empoasca* and the variety of potato; where leafhopper control was poor, 63 per cent. of the tubers of one variety and 1·5 per cent. of those of another were infested, whereas damage to the first was very light in fields receiving adequate leafhopper protection.

Sylvester (E. S.), Burton (V. E.) & Duncan (R. B.). **Field evaluation of demeton in the control of beet yellows virus.**—*J. econ. Ent.* **52** no. 5 pp. 910–917, 4 figs. Menasha, Wis., 1959.

The following is based on the authors' summary. In tests in three fields of sugar-beet in Kern County, California, in 1958, the reduction in numbers of *Myzus persicae* (Sulz.) and delayed incidence of infection with virus yellows in plots sprayed with demeton at weekly intervals from 21st February to 6th May resulted in significant increases in yield and percentage sugar. Populations of aphids were initiated by alates early in February and disappeared in May, probably owing to maturation of the plants and the onset of high temperatures. Virus symptoms were first observed in early April, and the disease spread until almost all the plants were infected. The best available evidence indicated that spraying would delay total infection for about three weeks; it increased the percentage of sugar in all plots and the tonnage of beet in all but one field, in which growing conditions were poor.

Smith (E. H.) & Fiori (B. J.). **The use of the plum curculio in toxicological studies.**—*J. econ. Ent.* **52** no. 5 pp. 921–928, 5 figs., 8 refs. Menasha, Wis., 1959.

The following is based largely on the authors' abstract. A method was developed in New York for evaluating insecticides against *Conotrachelus nenuphar* (Hbst.), using adults reared in the laboratory from a multi-brooded southern strain [*cf. R.A.E.*, A **46** 181]. These responded in the same way as adults of the local single-brooded strain ovipositing after hibernation, but differently from those that had not hibernated and were therefore not ovipositing [*cf. loc. cit.*].

The inherent toxicity of insecticides was determined from the mortality caused by topical application of various dosages in 1 ml. acetone to the dorsal thoracic area and by confining individual ovipositing adults on immature sprayed apples and observing reductions in feeding and oviposition as well as mortality. Resistance to weathering was determined from the mortality of insects caged on foliage collected from the field at intervals after spraying.

With few exceptions, the order of effectiveness of the insecticides agreed with that found in the field. Mevinphos (Phosdrin), GC-3661 (diethyl 1,3-di-(methoxycarbonyl)-1-propen-2-yl phosphate), dieldrin, parathion, malathion and diazinon approached azinphos-methyl (Guthion) in toxicity in contact tests, and all but the first did so in feeding tests, but only CG-3661 had as good persistence; DDT was quite ineffective.

Michelbacher (A. E.). **Spider mites on walnut in northern California.**—*J. econ. Ent.* **52** no. 5 pp. 936–939, 19 refs. Menasha, Wis., 1959.

The following is substantially the author's abstract. The importance of spider mites, mainly *Tetranychus pacificus* McG., *T. telarius* (L.) and *Panonychus ulmi* (Koch), on walnut in California has increased since the introduction of DDT and the newer organic insecticides; the increases in population become greater as the dosage of DDT is increased. They result from other factors besides the interference of insecticides with natural enemies, and these may affect the mites directly or through the food-plant [*cf. R.A.E.*, A **41** 82, 203]. Populations of *T. pacificus* and *T. telarius* have been suppressed and those of *P. ulmi* increased where schradan has been used in sprays against *Chromaphis juglandicola* (Kalt.) [**45** 31; **47** 430]. In the hot interior San Joaquin Valley, where the climate is less favourable to *P. ulmi* than in the more coastal regions, natural enemies usually control the mite before it has done serious damage; in the cooler regions, natural enemies may be ineffective and acaricides needed. Walnut can tolerate a relatively large mite population, and this allows enough time to determine whether natural enemies will be able to exert control. They often reduce the mites to a sub-economic level, even when such materials as DDT or Sevin are applied. Control is complicated by the possible development of resistance, since an acaricide may become an agent inducing mite development once the pest develops resistance to it. Of the newer acaricides tested against *P. ulmi*, the most effective were Tedion and Kelthane.

Fronk (W. D.). **Observations in Wyoming on the alfalfa weevil and its control.**—*J. econ. Ent.* **52** no. 5 pp. 939–942, 2 figs., 10 refs. Menasha, Wis., 1959.

The following is based on the author's abstract. *Hypera variabilis* (Hbst.) (*postica* (Gylh.)) is not uniformly distributed on lucerne throughout Wyoming; the uninfested areas are cooler and have a much shorter growing season than the infested ones, and rainfall seems to play little part. The distribution of larvae in a single field was found to be uniform, but the adults tended to be more numerous near the edges of the field, where hibernation quarters were available.

In granules applied in April 1956 or May 1957, 4 oz. heptachlor per acre gave better control of the larvae than did 4 oz. dieldrin, but 1·25 lb. dieldrin gave good control for two years. *Lygus* sp. were more numerous and *Macrosiphum pisum* (Harris) less so on untreated than on treated plots. When applied in 12 U.S. gal. spray per acre in July 1958, 4 oz. mevinphos (Phosdrin) or 1 lb. malathion gave initial control of the larvae, and plots sprayed with 4 oz. mevinphos or 3 oz. demeton had the lowest larval population a fortnight later. Fields that had never been treated with dieldrin had 3–7 times as many adults in spring as fields that had been treated at least once in three years.

WHITNEY (W. K.) & HAREIN (P. K.). **Effects of number of test insects, exposure period, and posttreatment interval on reliability of fumigant bioassays.**—*J. econ. Ent.* **52** no. 5 pp. 942–949, 10 figs., 7 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. The reproducibility of the results in standardised laboratory fumigation tests with a mixture of carbon tetrachloride and carbon bisulphide (80:20 by volume) in empty 20-litre bottles at 80°F. against adults of *Tribolium confusum* Duv. and *Oryzaephilus surinamensis* (L.) and all stages of *Sitophilus oryzae* (L.) for 4, 8, 24 or 48 hours was investigated. The insects were confined in ten wire-mesh cages per bottle, and analysis and evaluations showed that the optimum number of adults per cage was 50, that *S. oryzae* and *T. confusum* should be kept for at least 10 days and *O. surinamensis* for 15 days after fumigation for final mortality counts, that the order of decreasing resistance to the fumigant was pupae, eggs and larvae of *Sitophilus* and adults of *Oryzaephilus*. *Tribolium* and *Sitophilus*, and that variations in results, which were greatest with adults of *Sitophilus* and least with the larvae, were unpredictable. The results of parallel tests on different days were sometimes highly variable, but replicates within a day were reasonably consistent. Adults showed greater variations after long than after short exposures, whereas the immature weevils responded erratically after short exposures but varied least of all groups in 48-hour exposures; sublethal exposures retarded their rate of development. For 24-hour exposures, the LC50's were 290 and 165 micromoles per litre for adults of *T. confusum* and *S. oryzae* and 125, 155 and 375 for eggs and young larvae, young and medium-aged larvae, and older larvae and pupae of *S. oryzae*, respectively. The corresponding LC90's were 370, 220, 500, 345 and 865 micromoles per l. The values for exposures of four and eight hours were greater, and those for 48 hours less, than those for 24 hours.

HACKEROTT (H. L.) & HARVEY (T. L.). **Effect of temperature on spotted alfalfa aphid reaction to resistance in alfalfa.**—*J. econ. Ent.* **52** no. 5 pp. 949–953, 1 fig., 10 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract of this account of investigations in Kansas on the influence of temperature on the reproduction and development of *Therioaphis maculata* (Buckt.) on susceptible, intermediate and resistant clones of lucerne and on the survival of infested seedling progenies of resistant and susceptible plants. The effect of different temperatures on the response of the aphid was not the same on plants varying in resistance, since survival and reproduction were reduced relatively more on a resistant plant at high than at low temperatures as compared with a susceptible one; it appeared that a resistant plant on which an aphid population could not be maintained at 80°F. would support a limited population at 60°F.

Variations in temperature between 60 and 90°F. influenced the reaction of adults and nymphs on plants of the three groups in numerous ways. The optimum temperature for the reproductive period, the total reproduction of adults and the numbers of nymphs maturing and reproducing fell with an increase in plant resistance. Rates of reproduction decreased with a fall in temperature and with an increase in plant resistance, and differences among plants were evident at all except the lowest temperature. A post-reproduction period occurred on the susceptible plant at temperatures of 60–90°F., but was not evident on the resistant and intermediate ones. The time required for nymphs to mature and reproduce was longer at 60 than at 80°F.

and appeared to become greater with an increase in resistance of the plants. Where resistance limited survival, adults appeared to survive longer than nymphs.

Infested seedlings from both resistant and susceptible clones were killed by the aphid more rapidly at high than at low temperatures, but final survival did not appear to be affected by temperature, indicating that resistant seedlings would grow satisfactorily in spite of infestation during the cool periods of early spring and late autumn.

STEINHAUER (A. L.). **The biology and seasonal development of the vetch Bruchid,** *Bruchus brachialis* **Fahraeus, in Oregon.**—*J. econ. Ent.* **52** no. 5 pp. 955–957, 5 refs. Menasha, Wis., 1959.

The following is substantially the author's abstract. In 1954 and 1955, the first adults of *Bruchus brachialis* Fhs. emerged from hibernation in the Willamette Valley of Oregon during the latter half of April. Adults continued to emerge until field populations reached their peak in late May and early June. Mating occurred shortly after emergence, and oviposition began on 10th–18th June, when the first pods appeared on hairy vetch (*Vicia villosa*), and continued into the beginning of August, when most of the pods were mature. The adult population declined steadily from the time of peak abundance until early August, when none could be found. The eggs began to hatch towards the end of June, and larvae continued to appear until early August. They penetrated the pods and fed within individual seeds, larval development being evident until late September. The first pupae appeared in mid-August, and the first newly emerged adults at the beginning of September. The latter apparently sought hibernation sites soon after emergence, since they were rarely collected in the field. Many of the adults did not emerge from the seeds in the autumn and remained alive in storage bins and granaries until the next spring.

HOWITT (A. J.) & COLE (S. G.). **Chemical control of the carrot rust fly,** *Psila rosae* **(F.), in western Washington.**—*J. econ. Ent.* **52** no. 5 pp. 963–966, 1 fig., 3 refs. Menasha, Wis., 1959.

Psila rosae (F.) is normally controlled on carrot in Washington by chlorinated hydrocarbons applied to the soil surface or worked into the top few inches, but a highly resistant strain appeared in the Lake Sammamish region of the State in 1957, and the crop was destroyed despite repeated treatments. Tests of 22 compounds, including chlorinated compounds and phosphates, were made in 1954–58, and it was found in 1958 that 1–4 lb. diazinon per acre, applied as granules in the furrow during sowing, gave outstanding control, as indicated by the percentage of plants infested and the weight of marketable carrots produced, though 5 lb. diazinon was ineffective when worked into the soil in 2-ft. bands along the rows before sowing. When applied in the furrow, 3 lb. parathion or Am. Cyanamid 18133 (O,O-diethyl O-2-pyrazinyl phosphorothioate) per acre in granules or 3 lb. dicapthon in a dust gave fair control; the other compounds tested were relatively ineffective in either soil or furrow treatments.

CRAWFORD (C. S.) & HARWOOD (R. F.). **Lepidoptera associated with grasses grown for seed in eastern Washington.**—*J. econ. Ent.* **52** no. 5 pp. 966–969, 14 refs. Menasha, Wis., 1959.

A survey of the Lepidoptera infesting grasses grown for seed between Spokane, Washington, and the Idaho border in 1957 was made by means of light-traps, emergence traps placed over seven kinds of grass, and soil sampling for larvae. The results and information from the literature showed that more than 30 species in four families were present. *Crambus topiarius* Zell., *Apamea* (*Crymodes*) *devastatrix* (Brace) and *Chionodes psiloptera* (Barnes & Busck) were particularly destructive, and three other species of *Crambus* were probably important. The relations of temperature, humidity and rainfall to catches of adults in light-traps are discussed.

Reed (J. P.). **The role of granulated insecticides for control of sweet corn pests in New Jersey.**—*J. econ. Ent.* **52** no. 5 pp. 972–974, 5 refs. Menasha, Wis., 1959.

In New Jersey, sweet maize is sown between early April and mid-July and harvested from late June until the onset of frosts, so that plants in the whorl stage are present from May to September. Granular insecticides are effective against *Ostrinia* (*Pyrausta*) *nubilalis* (Hb.), *Heliothis zea* (Boddie) and *Spodoptera* (*Laphygma*) *frugiperda* (J. E. Smith), and also against *Aphis* (*Rhopalosiphum*) *maidis* Fitch if they contain phosphates, while the plants are in the whorl stage, but not when they are in the tassel or ear stage. Sprays or dusts are therefore necessary at these stages, but they can be supplemented by the cheaper applications of granules at the whorl stage. In tests in 1954–57, granules of 2·5 per cent. heptachlor on Attaclay and 1 per cent. parathion on tobacco, applied at 25–30 lb. per acre, gave excellent control of *O. nubilalis*, *H. zea* and *S. frugiperda*, and were more effective than any of the other materials tested. Parathion was the most effective when the aphid was present. It was found that when treatment is delayed until most of the eggs have hatched, a single application will give excellent control of *O. nubilalis* under normal conditions and that two applications 10–15 days apart will control a severe infestation.

Cowan jr. (C. B.), Parencia jr. (C. R.) & Davis (J. W.). **Field experiments for control of late-season infestations of several cotton insects.**—*J. econ. Ent.* **52** no. 5 pp. 975–977, 4 refs. Menasha, Wis., 1959.

Further tests of insecticides against pests attacking cotton late in the season [*cf. R.A.E.*, A **48** 25] were made in Texas in 1958, when *Anthonomus grandis* Boh. and *Heliothis zea* (Boddie) were the predominant species and *Alabama argillacea* (Hb.) was important. The following is based on the authors' abstract.

Sevin, applied at 1–1·6 lb. per acre with sulphur in dusts and at about 1·5 lb. per acre in a spray gave effective control of *Anthonomus* and *Heliothis* when applied five times in June–July. In sprays containing DDT, applied seven times in July and early August, 7 lb. calcium arsenate, 0·5 lb. Monsanto CP-7769 (hexaethyl ethylthiomethylidynetriphosphonate) or 1 lb. dicapthon per acre was as effective as 0·38 lb. dieldrin or 0·25 lb. azinphos-methyl (Guthion) against *A. grandis*, but the calcium-arsenate spray gave poor control of *H. zea*. In a single application on 7th August, Trithion, ethion and Delnav [2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)] at 0·5 lb., demeton and CP-7769 at 0·25 lb. and Kelthane and dicapthon at 1 lb. per acre were equally effective against *Tetranychus desertorum* Banks for seven days after treatment. Single applications of sprays containing 2 lb. toxaphene with 1 lb. DDT, 1 lb. Sevin, 0·38 lb. malathion or dicapthon or 0·3 lb. endrin per acre were effective against *Alabama*, whereas 0·9 lb. Sevin in a dust gave only fair control and 0·25 lb. CP-7769 in a spray was unsatisfactory.

Adkisson (P. L.), Wilkes (L. H.) & Cochran (B. J.). **Relative efficiencies of certain spray nozzles for cotton insect control.**—*J. econ. Ent.* **52** no. 5 pp. 985–991, 5 figs., 7 refs. Menasha, Wis., 1959.

The following is substantially the authors' abstract. Two conventional cone-type spray nozzles were compared with three kinds of wide-swath, boomless, jet-type nozzles, covering 6–12 rows per nozzle, for the application of sprays against *Anthonomus grandis* Boh. and *Heliothis zea* (Boddie) on cotton in Texas. The tests were arranged in randomised replicated small plots and were conducted under irrigated and dry-land conditions; the sprays contained DDT with other insecticides, and three rates of application were used. The results indicated that the conventional cone-type nozzles resulted in significantly better control of *Anthonomus* and were slightly more effective against *Heliothis*. All treated plots gave significantly higher yields than untreated ones, but the highest yields were obtained from the plots sprayed with the conventional nozzles. Deposits on cards indicated that the wide-swath nozzles gave larger droplets and lower plant coverage with an increase in distance from the nozzle, and mortality records for *Anthonomus* and yield data indicated that this larger droplet size was mainly responsible for their inferior performance.

Klostermeyer (E. C.). **Insecticide-induced population changes in four mite species on alfalfa.**—*J. econ. Ent.* **52** no. 5 pp. 991–994, 1 fig., 5 refs. Menasha, Wis., 1959.

The following is based largely on the author's abstract of this account of studies on mite populations made in the course of tests with insecticides on lucerne in Washington State in 1953–57. Emulsion sprays were applied at 20 U.S. gal. per acre, usually just before bloom, in early July, and again 3–4 weeks later, and three basic effects were found. DDT treatments increased populations of *Tetranychus telarius* (L.) and reduced those of two predacious species, *Typhlodromus cucumeris* Oudm. and *Tydeus* sp. Dieldrin and endrin increased populations of *Typhlodromus* and reduced those of *Tetranychus* and *Tydeus*, and schradan and other organic phosphates increased populations of *Tydeus* and reduced those of *Typhlodromus* and *Tetranychus*. Combinations of materials caused intermediate results. *Tarsonemus confusus* Ewing, which was rarely abundant, was increased in numbers by demeton and reduced by dieldrin. The population changes occurred during the 4–6 weeks after treatment and were the result of a combination of direct effects on individual species and of biotic interactions. Since large populations of *Typhlodromus* and *Tydeus* developed although *Tetranychus telarius* was almost absent, they were evidently not dependent on it as a source of food.

Coon (B. F.). **Grass hosts of cereal aphids.**—*J. econ. Ent.* **52** no. 5 pp. 994–996, 1 ref. Menasha, Wis., 1959.

Macrosiphum avenae (F.) (*granarium* (Kby.)) and *Rhopalosiphum fitchii* (Sand.), which are vectors of the barley yellow-dwarf virus [*cf. R.A.E.*, A **46** 18], were found to be abundant on cereals in the field in Pennsylvania. They feed on small grains during most of the growing season and migrate to grasses, many of which are reservoirs of the virus, during the summer. The efficiency of a grass species in maintaining an aphid population depends on the ability of the adult aphid to obtain adequate nutrients from it for long enough to produce progeny, the ability of the progeny to feed and mature on it and the provision of the stimuli necessary for reproduction. The relative efficiency of 59 species in 30 genera was investigated in the laboratory, and the results are shown in a table and discussed.

HYCHE (L. L.) & ARTHUR (B. W.). **Systemic insecticides for citrus whitefly control on gardenia.**—*J. econ. Ent.* **52** no. 5 pp. 1008–1010, 4 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. Experiments were carried out in Alabama in 1953–56 on the control of *Dialeurodes citri* (Ashm.) on two varieties of *Gardenia jasminoides* in pots containing 0·1 cu. ft. soil. Spraying the leaves to run-off with 1 pint 50 per cent. demeton, 50 per cent. methyl-demeton, 48 per cent. Am. Cyanamid 12008 or 12009 (O,O-diethyl S-isopropyl- and S-propylthiomethyl phosphorodithioate, respectively) or 25 per cent. Delnav [2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)] or 2 gal. white oil per 100 gal. was very effective, but foliage sprays of schradan, malathion, parathion or Isolan were less so. When applied by pouring 50 ml. water containing 0·125 per cent. technical compound on the soil round the base of each plant, demeton, Am. Cyanamid 12008 and 12009, phorate (Thimet) and Di-Syston (O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate) also gave very effective control. Two applications to either the foliage or the soil were necessary for the best results.

CLARK (E. W.), WILLIAMSON (A. L.) & RICHMOND (C. A.). **A collecting technique for pink bollworms and other insects using a Berlese funnel with an improved heater.**—*J. econ. Ent.* **52** no. 5 pp. 1010–1012, 1 fig., 12 refs. Menasha, Wis., 1959.

Investigations on the use of heat to remove diapause larvae of *Pectinophora gossypiella* (Saund.) from cotton seed or similar material for experimental purposes were made in the laboratory in Texas. Preliminary tests showed that the inactive larvae must be activated by moistening the seeds for at least 24 hours before treatment. A modified Berlese apparatus designed to apply uniform heat to large amounts of seed is described, and it is stated that the results of 300 tests showed that 80–100 per cent. of the larvae in diapause could be driven from cotton seed or seed cotton by maintaining it at 90–100°F. under moist conditions for 70–100 hours and then subjecting it to about 110°F. in the apparatus for 30–60 minutes on three consecutive days.

WALKER (D. W.) & LOCKE (R.). **Evaluation of off-odor in malathion-treated wheat.**—*J. econ. Ent.* **52** no. 5 p. 1013, 3 refs. Menasha, Wis., 1959.

Malathion is effective for the protection of stored wheat against insects [*cf. R.A.E.*, A **46** 236; **48** 225], but has resulted in objectionable odours during milling and baking. Tests with heated wheat showed no significant difference in odour between untreated samples, those treated with 4–16 parts malathion per million 68 days before evaluation and those treated with 8 p.p.m. one day before, whereas samples treated with 100 p.p.m. 1–68 days before were considered objectionable by most people and differed significantly from those treated with 8 p.p.m. one day before or 16 p.p.m. 68 days before. It is concluded that malathion at the recommended rate of 8 p.p.m. for storage periods of 68 days will not produce an objectionable odour.

GRIGARICK (A. A.) & TANADA (Y.). **A field test for the control of** *Trichoplusia ni* **(Hbn.) on celery with several insecticides and** *Bacillus thuringiensis* **Berliner.**—*J. econ. Ent.* **52** no. 5 pp. 1013–1014, 3 refs. Menasha, Wis., 1959.

Trichoplusia ni (Hb.) is common on celery in San Joaquin County, California, in late September and October, and insecticides for its control were tested on 7th October 1958; the plants were 10–15 in. high, and more than 80 per cent. of the larvae were in the first or second instars for at least 14 days after treatment. In 50 lb. dusts per acre, mixtures of 4 per cent. malathion with 5 per cent. ethyl-DDD (Perthane) or 5 per cent. DDT with 15 per cent. toxaphene were effective against all instars for at least 14 days, 3 per cent. Thiodan and 3×10^9 spores of *Bacillus thuringiensis* per g. were rather less effective, and 2 per cent. parathion and 1·5 per cent. mevinphos (Phosdrin) were effective at first, but had less residual effect. The bacterial dust compared favourably with the two mixtures against larvae in the 3rd–5th instars. Sprays containing *B. thuringiensis*, dimethoate or Am. Cyanamid 18706 (O,O-dimethyl S-ethylcarbamoylmethyl phosphorodithioate) had little effect. The lack of toxicity of *B. thuringiensis* to plants and mammals [*cf. R.A.E.*, A **48** 505] suggests its use for pre-harvest control.

FISHER (R. W.). **Polybutenes—a new control for phytophagous mites.**—*J. econ. Ent.* **52** no. 5 p. 1015, 1 fig., 1 ref. Menasha, Wis., 1959.

Polybutenes varying in viscosity from 40 to 20,500 S.S.U. at 210°F. were tested for their ability to trap and kill *Tetranychus telarius* (L.) on greenhouse plants, and a 5 per cent. emulsion of the best of them, Indopol H-1500 (viscosity 15,000 sec.), sprayed on heavily infested leaves, trapped the motile forms at once and either killed the eggs or immobilised the larvae when they hatched. A heavy infestation on melon was eliminated by the time all the eggs had hatched, and excellent control was obtained on several other plants. Spraying uninfested plants prevented or delayed subsequent infestation. As polybutenes are not volatile or soluble in water, they should have a very persistent action.

When halves of lima-bean leaves were sprayed and the other halves heavily infested with active mites of all stages, the 5 per cent. emulsion permitted no invasion of the sprayed halves for seven days and only slight marginal invasion after 11, a 3 per cent. emulsion permitted slight marginal invasion in seven days and invasion of 25 per cent. of the area in 11, and a 1 per cent. emulsion had little effect. There was no spray damage to the plants.

DONLEY (D. E.). **A note on the persistence of Phosdrin.**—*J. econ. Ent.* **52** no. 5 pp. 1015–1016. Menasha, Wis., 1959.

In tests in Ohio, 0·5, 1 or 2 ml. technical mevinphos (Phosdrin), placed directly on the trunks of saplings of pin oak (*Quercus palustris*) infested by *Anisota senatoria* (J.E.Smith), had no effect on the larvae feeding on the leaves after 24 hours, caused some mortality, which increased with the dosage, after 48 hours and gave complete control after 72 hours. Bioassay of extracts of the foliage with *Daphnia pulex* (L.) [*cf. R.A.E.*, A **45** 28] indicated that mevinphos or its metabolites occurred in the tissue for more than 48 but less than 72 hours. There was no evidence of foliage damage, but treated trunks showed small spots of dead bark.

Mistric jr. (W. J.). **Evaluation of damage to cotton caused by low-clearance general-purpose tractor in applying insecticides.**—*J. econ. Ent.* **52** no. 5 pp. 1016–1017. Menasha, Wis., 1959.

Cotton growers in North Carolina are reluctant to apply insecticides to rank cotton because of expected mechanical injury to the crop by ordinary spraying machinery. The damage caused by a low-clearance general-purpose tractor, used in a crop severely infested by *Anthonomus grandis* Boh., was tested in 1956. Dusts of 5 per cent. DDT mixed with 2 per cent. dieldrin, 2·5 per cent. methyl-parathion or 2·5 per cent. azinphos-methyl (Guthion) were applied at about 21 lb. per acre 11 times between 11th July and 15th August, when the plants averaged 4·5 ft. in height; a six-row duster, with the boom 4 in. above the plants and one nozzle over each row, was mounted behind a four-wheel tractor, which straddled one row at a height of 13 in. and was driven at about 5 miles per hour. Treatment reduced the average square infestation from 98 to 61 per cent. and the average number of adults per 100 squares from 18·9 to 7·5. Analysis of the results showed that the yield of seed cotton was increased by 55 per cent. to 1,394 lb. per acre, whereas it would have been increased by 60 per cent. to 1,438 lb. if the tractor had caused no damage.

Harries (F. H.). **Effects of physical properties of derris dusts on their toxicity to the Mexican bean beetle.**—*J. econ. Ent.* **52** no. 5 p. 1017, 3 refs. Menasha, Wis., 1959.

In a study in Ohio in 1943 of the variations in the results obtained with derris dusts against *Epilachna varivestis* Muls. on beans, the effects of different properties of the dusts were tested. Four samples of derris root containing different percentages of rotenone were ground to particle sizes of 6, 7 and 9 μ, diluted to a strength of 1 per cent. rotenone with pyrophyllite of 3, 6, 9 and 12 μ particle size and compared in a factorial experiment in the greenhouse. Plants with two leaves were dusted, infested with ten third-instar larvae and maintained at 80°F. and 50 per cent. relative humidity for three days, after which larval mortality and the area of leaf eaten showed that an increase in the derris content (8·6–25·6 per cent.) of the dusts or the particle size of the derris or the diluent all tended to reduce toxicity [*cf. R.A.E.*, A **45** 269].

Peterson jr. (G. D.). **Effectiveness of three organophosphorous compounds against larvae of the painted lady in alfalfa.**—*J. econ. Ent.* **52** no. 5 pp. 1017–1018, 5 refs. Menasha, Wis., 1959.

Larvae of *Vanessa cardui* (L.) damage numerous plants in southern California. They were very abundant in lucerne fields in the Imperial Valley in February and March 1958, first defoliating *Malva parviflora* and then attacking the lucerne, but causing practically no damage of economic importance. Parathion, mevinphos (Phosdrin) and trichlorphon (Dylox), applied by aeroplane at 4 oz. in 5 U.S.gal. spray per acre on 3rd March, when the lucerne was about 12–15 in. tall, caused 92, 93 and 79 per cent. mortality after two days and 99, 97 and 73 per cent. after five; the first two materials were considered satisfactory.

VANDERZANT (E. S.). **Inositol: an indispensable dietary requirement for the boll weevil.**—*J. econ. Ent.* **52** no. 5 pp. 1018–1019, 6 refs. Menasha, Wis., 1959.

In rearing tests already noticed [*R.A.E.*, A **47** 322], *Anthonomus grandis* Boh. developed on pure diets containing soy-bean protein or casein with yeast, but not on casein as the only protein. Further tests showed that inositol was responsible for the difference. Larvae died in or soon after the first instar if inositol was omitted and before pupation if less than 1 mg. per 100 g. was present. Concentrations of 1–5 mg. resulted in slight growth, and 7·5 mg. was adequate.

BREZNER (J.). **An electrically operated micro dispenser.**—*J. econ. Ent.* **52** no. 5 pp. 1019–1020, 2 figs., 1 ref. Menasha, Wis., 1959.

The author describes a device for the accurate delivery of small quantities of insecticide, in which a synchronous motor operated through a timer rotates a micrometer for a given time, and this controls the dose delivered by the syringe. The insect is placed under the delivery needle, and a foot switch is pressed; both hands are left free and attention is not diverted from the subject.

LANDIS (B. J.) & GETZENDANER (C. W.). **Millipede injury to potatoes.**—*J. econ. Ent.* **52** no. 5 pp. 1021–1022, 1 fig., 12 refs. Menasha, Wis., 1959.

Blaniulus guttulatus (Bosc) was first observed in Washington in 1943, when it attacked the remains of old seed potatoes in April and the tubers of the new crop grown in the shade in July. It was unusually abundant and injured parts of various plants in 1949, damaged asparagus in 1952 and was collected from soil in a greenhouse in 1959. It overwinters in potato tubers and other decaying vegetation and is probably the most important pest of potato seed pieces in cold wet springs. In 1945, dipping freshly cut seed pieces in a paste of DDT or phenothiazine mixed with flour and water had no effect on the numbers damaged, but 0·4 per cent. DDT reduced the numbers of living millepedes per hill by about 50 per cent. and 4 per cent. phenothiazine caused heavy mortality. In 1947, mixing 1 lb. γ BHC per acre into the soil before the potatoes were planted eliminated millepede injury at harvest, as compared with slight injury in untreated soil, but did not prevent heavy infestation in the following year.

NIELSON (M. W.) & CURIE (W. E.). **Effect of alfalfa variety on the biology of the spotted alfalfa aphid in Arizona.**—*J. econ. Ent.* **52** no. 5 pp. 1023–1024, 11 refs. Menasha, Wis., 1959.

In experiments in Arizona, *Therioaphis maculata* (Buckt.) was reared on lucerne plants of two susceptible and two resistant varieties from 4th June to 1st July 1958. Daily observations showed that the life-cycle lasted about 6·5 days on the susceptible and 7·5–8·5 days on the resistant varieties, with 44–46 per cent. survival to the adult stage on the former and only 2–17 per cent. on the latter. Adults lived for about two weeks on all varieties, but fewer survived and reproduced on the resistant ones, and the number of progeny per adult per day was lower.

Clancy (D. W.) & Muma (M. H.). **Purple scale parasite found in Florida.**—*J. econ. Ent.* **52** no. 5 pp. 1025–1026, 3 refs. Menasha, Wis., 1959.

In June 1958, eggs, larvae and pupae of *Aphytis lepidosaphes* Comp. were found in mature females of *Lepidosaphes beckii* (Newm.), the most important Coccid attacking *Citrus* in Florida. The Aphelinid had been introduced into California [*cf. R.A.E.*, A **45** 377], Texas and Mexico, but there is no record of its introduction into Florida, where it was found to occur practically throughout the peninsula, even in isolated *Citrus* plantings, indicating that it has been present for some time. It was very abundant in unsprayed groves and quite common in sprayed ones, giving an average of 24·6 per cent. parasitism of the adult females of *L. beckii*. Of the Coccids containing *A. lepidosaphes*, 94·8 per cent. were adult females, 4·9 per cent. males and 0·3 per cent. second-instar females. Young adult females were preferred, but older ones in various stages of ovipositing were also attacked, and 52·2 per cent. contained one parasite, 43·3 per cent. two and the remainder up to five, host size determining the number that could develop; 58·6 per cent. of the parasites reared were females.

In Florida, males and second-instar females of *L. beckii* are parasitised by *Aspidiotiphagus lounsburyi* (Berl. & Paoli), *A. citrinus* (Craw) and *Prospaltella aurantii* (How.), but adult females are rarely attacked, and the addition of *Aphytis lepidosaphes* to the parasite complex should result in more effective natural control. In a survey of *Citrus* plantings along the Gulf Coast in November 1958, *A. lepidosaphes* was abundant in *L. beckii* in the delta area south of New Orleans, Louisiana, but did not occur in Alabama, and it has not yet been recorded from Mississippi or north-western Florida.

Taylor (E. A.), Henneberry (T. J.) & Smith (F. F.). **Control of resistant spider mites on greenhouse roses.**—*J. econ. Ent.* **52** no. 5 pp. 1026–1027, 1 ref. Menasha, Wis., 1959.

The development of resistance in *Tetranychus telarius* (L.) to acaricides is a major problem to growers of greenhouse roses in the United States, and various materials were compared in sprays against a strain highly resistant to all organic phosphates, Aramite (2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite) and Kelthane at Beltsville, Maryland. Eight weekly applications were made between 23rd December 1957 and 10th February 1958, and weekly counts showed that 2 lb. 15 per cent. Aramite with either 2 lb. 25 per cent. Tedion or 0·1 U.S.gal. schradan per 100 U.S.gal. controlled the mite, whereas the Tedion alone or 1 lb. 50 per cent. chlorfenson (ovex) were relatively ineffective. In a second test in March–May, Aramite with either Tedion or schradan resulted in significantly fewer mites than did Tedion alone or Aramite with 0·1 U.S.gal. demeton per 100 U.S.gal. The schradan and demeton treatments resulted in spray injury to the lower foliage and reduced flower production below that from Aramite with Tedion.

In a commercial greenhouse in New Jersey, three weekly applications in February–March and three in April 1958 of 1 lb. 15 per cent. wettable Aramite with 1 lb. 25 per cent. wettable Tedion per 100 U.S.gal. caused considerable reductions in mite populations by 2nd April, and this treatment and spraying with Tedion alone kept the numbers much lower in April–May than spraying with Aramite alone or syringing frequently with water. None of the sprays had any appreciable toxic effect on tolerant varieties of roses, but syringing caused premature drop of the lower leaves. The combined spray was used for a year and injured plants of only two varieties.

Areekul (S.) & Harwood (R. F.). **Two organisms suitable for bioassaying specific acaricides.**—*J. agric. Fd Chem.* **8** no. 1 pp. 32–36, 2 graphs, 11 refs. Easton, Pa., 1960.

In tests on the bioassay of acaricides, the brine shrimp, *Artemia salina* [*cf. R.A.E.*, A **48** 116], and a stored-products mite, *Tyrophagus putrescentiae* (Schr.), showed promise as test organisms. The former was exposed in shell vials to toxicants in acetone introduced into the salt solution, and the latter to a dry film of acaricide in a chamber made from opposed microscope depression slides. Toxicity curves for seven acaricides are shown. Bioassay of Kelthane on pears and cherries, using these two organisms and extractives from the fruits to establish standard curves, was in close agreement with the colorimetric method frequently used.

Menn (J. J.), Eldefrawi (M. E.) & Gordon (H. T.). **Prechromatographic purification of insecticides from insect tissue extracts.**—*J. agric. Fd Chem.* **8** no. 1 pp. 41–42, 2 figs., 4 refs. Easton, Pa., 1960.

The following is virtually the authors' summary. Paper chromatograms of acetone extracts of insecticides and their metabolites from insect tissues are often smeared and unrecognisable. When a crude extract is spotted on filter paper and eluted with acetonitrile, the solvent selectively extracts insecticides, metabolites, and 20–30 per cent. of the insect lipide material, but not the interfering lipides. The purified extracts give clear chromatograms, on which insecticides and metabolites can be identified. This rapid and simple purification is very useful in studies of insecticide metabolism.

Kirkpatrick (M. E.), Brogdon (J. L.) & Matthews (R. H.). **Flavor of cantaloups as affected by treatment with lindane.**—*J. agric. Fd Chem.* **8** no. 1 pp. 57–58, 4 refs. Easton, Pa., 1960.

The following is substantially the authors' summary. The flavour of cantaloup melons treated with lindane [γ BHC] as a dust, wettable powder or emulsion concentrate at the rate of 0·35 lb. active ingredient per acre in each of four applications was compared with that of untreated cantaloups. The results indicated that the dust had no detrimental effect on flavour. The effect of the wettable powder was less definite, and its use may contribute to off-flavour. Treatment with the emulsion concentrate had an adverse effect on flavour.

Mattson (A. M.) & Sedlak (V. A.). **Ether-extractable urinary phosphates in man and rats derived from malathion and similar compounds.**—*J. agric. Fd Chem.* **8** no. 2 pp. 107–110, 8 refs. Easton, Pa., 1960.

The following is virtually the authors' summary. The urinary excretion of malathion metabolites was studied to develop a chemical method that could be used as a measure of the exposure of workers to the insecticide. After exposure to malathion, ether-extractable phosphatic compounds appear in the urine of man and rats. Quantitative determination was accomplished by a colorimetric method for phosphates. The amounts of these materials were proportional to dosage. Preliminary studies with other similar compounds were made. This method is useful in detecting and evaluating the degree of exposure to malathion. It is far more sensitive than measurement of cholinesterase inhibition.

Elliott (J. W.), Walker (K. C.), Penick (A. E.) & Durham (W. F.). **A sensitive procedure for urinary *p*-nitrophenol determination as a measure of exposure to parathion.**—*J. agric. Fd Chem.* **8** no. 2 pp. 111–113, 5 refs. Easton, Pa., 1960.

The following is based on the authors' summary. A sensitive procedure has been developed for the measurement of human exposure to parathion, and also EPN, by the determination of p-nitrophenol in urine. The major variation from earlier published procedures involves extraction with acetonitrile to remove interfering impurities. The method allows determination of as little as 10 μg. p-nitrophenol and permits the use of urine samples as large as 100 ml.

Jurinak (J. J.), Brown (A. L.) & Martin (P. E.). **Extraction and determination of ethylene dibromide in soils.**—*J. agric. Fd Chem.* **8** no. 2 pp. 113–115, 1 fig., 4 refs. Easton, Pa., 1960.

The following is virtually the authors' summary. A method utilising vacuum distillation and catalytic oxidation is described for the determination of ethylene dibromide in soils. Recovery is reported in the range of about 82 to 0·2 mg. ethylene dibromide per 50 g. soil. Moisture and organic matter affect recovery.

Dauterman (W. C.), Viado (G. B.), Casida (J. E.) & O'Brien (R. D.). **Persistence of dimethoate and metabolites following foliar application to plants.**—*J. agric. Fd Chem.* **8** no. 2 pp. 115–119, 3 figs., 14 refs. Easton, Pa., 1960.

The following is virtually the authors' summary. Dimethoate (O,O-dimethyl S-methylcarbamoylmethyl phosphorodithioate) is known to be effective as a systemic insecticide following foliar application. Analyses were made of surface and absorbed residues following foliar treatment of maize, cotton, pea and potato plants with radioactive dimethoate. The insecticide was rapidly absorbed and decomposed both on the surface and in the foliage by phosphorothionate oxidation and hydrolysis. Only trace amounts of dimethoate and its oxygen analogue (O,O-dimethyl S-methylcarbamoylmethyl phosphorothioate] were present 32 days after treatment. Of the five identified hydrolysis products, the predominant one from nearly mature peas was phosphoric acid; from the other plants used as seedlings, it was O,O-dimethyl S-carboxymethyl phosphorothioate on the surface and O-methyl O-hydrogen S-methylcarbamoylmethyl phosphorodithioate within the leaf tissue. Limited studies were also made on the persistence of the N-ethylcarbamoylmethyl analogue of dimethoate, which was similar to that of dimethoate itself.

Lisk (D. J.). **Rapid combustion and determination of residues of chlorinated pesticides using a modified Schöniger method.**—*J. agric. Fd Chem.* **8** no. 2 pp. 119–121, 1 fig., 3 refs. Easton, Pa., 1960.

The following is virtually the author's summary. A method is described for the rapid combustion and determination of residues of chlorinated insecticides. Organic-solvent extracts of plant samples are evaporated in a cone of cellulose acetate, which is burned in an oxygen-filled (Schöniger) flask; the hydrogen-chloride gas is absorbed in dilute sodium hydroxide. The platinum holder was specially designed and a balloon attached to the flask to permit complete combustion of the cone and its contents safely. The spectrophotometric determination of chloride is based on its displacement of thiocyanate in the presence of ferric ion. The time required for combustion and determination of chloride is about 20 minutes per sample. The recovery of DDT, Thiodan and γ BHC (lindane) from lucerne by the method is described.

Berck (B.). **Retention of acrylonitrile and carbon tetrachloride by shelled walnuts fumigated with Acrylon.**—*J. agric. Fd Chem.* **8** no. 2 pp. 128–131, 1 fig., 9 refs. Easton, Pa., 1960.

The following is based on the author's summary. In tests in Canada, imported shelled walnuts, in 55-lb. batches, were successfully fumigated in polyethylene bags for the control of *Plodia interpunctella* (Hb.) by injecting 3 ml. Acrylon (34 per cent. acrylonitrile and 66 per cent. carbon tetrachloride by volume) into each bag and keeping the bags closed for 16 hours. The desorption rates of the two chemicals during a 38-day storage period showed that the residues were affected by fumigant dosage, duration of exposure and extent of fan aeration. Fumigation under reduced pressure, followed by storage for 30 days, resulted in lower residues of both than did fumigation at atmospheric pressure. Acrylonitrile was determined polarographically and carbon tetrachloride spectrophotometrically with satisfactory specificity and sensitivity.

Meyer (C. F.), Malina (M. A.) & Polen (P. B.). **Determination of heptachlor epoxide in fat and milk.**—*J. agric. Fd Chem.* **8** no. 3 pp. 183–186, 5 figs., 10 refs. Easton, Pa., 1960.

The following is virtually the authors' summary. Heptachlor, which is used for the control of forage insects, is altered, when ingested by dairy cattle, to its epoxide (1,4,5,6,7,8,8-heptachloro-2,3-epoxy-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene) [*R.A.E.*, A **46** 99]. As heptachlor epoxide is found primarily in the fat, methods were developed for the determination of microgram quantities in butterfat and beef fat. The Polen-Silverman reagent, which was originally developed for the determination of heptachlor, is also a sensitive colour-forming reagent for heptachlor epoxide. Methods are presented for the separation of heptachlor epoxide from butterfat and beef fat by chemical and chromatographic techniques and for the subsequent spectrophotometric analysis of the epoxide.

Fowkes (F. M.) & others. **Clay-catalyzed decomposition of insecticides.**—*J. agric. Fd Chem.* **8** no. 3 pp. 203–210, 10 graphs, 11 refs. Easton, Pa., 1960.

The following is virtually the authors' summary. Decomposition of chlorinated insecticides occurs in wettable powders and dusts as a result of the catalytic action of the clay diluent. The heat evolved is occasionally sufficient to cause spontaneous ignition. Rates of reaction of these insecticides in the presence of various clay diluents increase with increasing acidity of the clay surface. Treatment of the clays with volatile organic bases or basic-acting substances, such as urea or hexamethylenetetramine, reduces the acid strength and diminishes the rate of decomposition accordingly.

Sodium clays are usually sufficiently neutralised with one molecule of the appropriate base for each sodium ion. Reaction rates were determined from data obtained by infra-red analysis or bioassay of samples from isothermal storage, and by differential thermal analysis. With 25 per cent. concentrates, the reactions were zero order, and half times of reaction decreased upon dilution with clay, reaching a minimum at two molecules of insecticide per exchange ion.

GUNTHER (F. A.) & JEPPSON (L. R.). **Modern insecticides and world food production.**—9 × 6 in., xv + 284 pp., 31 pls., many refs. London, Chapman & Hall, Ltd., 1960. Price £2 10*s*.

This book is concerned with the chemical control of insects and other arthropods that affect the world's supply of food and the problems that arise in and from the use of insecticides and acaricides. The early chapters contain general information on the pests, their relations to the plants or animals on which they feed, and the methods of control available, and subsequent ones with modern insecticides in general, their effectiveness, the ways in which they are used, the deposits and residues involved, and the problem of resistance of insects to chemicals. Acaricides are discussed in a separate chapter. Five further chapters deal with toxicants of separate chemical groups, two with compounds used in fumigation and soil treatments, and a final one with attractants and repellents.

SCHEFER-IMMEL (V.). **Ein Massenauftreten von Kätzchenschädlingen an Aspe** (*Populus tremula*). [A mass outbreak of catkin pests on aspen (*P. tremula*).]—*Anz. Schädlingsk.* **31** pt. 1 pp. 7–10, 13 figs., 8 refs. Berlin, 1958.

In early March 1957, an outbreak of *Agrochola* (*Orthosia*) *circellaris* (Hfn.), *Cirrhia* (*Xanthia*) *fulvago* (L.), *Eucosma* (*Epiblema*) *nisella* (Cl.) and *Batrachedra praeangusta* (Haw.) occurred on an aspen tree (*Populus tremula*) used for crossing tests in a greenhouse in Germany and caused much damage to the female catkins. The habits of the moths are described.

STEUDEL (W.). **Die Rolle der Mietenlaus** (*Hyperomyzus tulipaellus* **Theob.**) **im Seuchenzyklus der Vergilbungskrankheit der** *Beta*-**Rüben** (*Beta*-**Virus 4,** *Corium betae* **Holmes**). [The rôle of the clamp aphid, *Rhopalosiphoninus staphyleae tulipaellus*, in the infection cycle of of beet-yellows.]—*Anz. Schädlingsk.* **31** pt. 5 pp. 67–71, 1 graph, 8 refs. Berlin, 1958.

Investigations in Germany showed that *Rhopalosiphoninus* (*Hyperomyzus*) *staphyleae tulipaellus* (Theo.) can sometimes serve as an important field vector of beet-yellows virus, though not of beet mosaic.

GAUSS (R.). **Der Bambusbohrer,** *Dinoderus minutus* **Fabr., in Deutschland!** [The bamboo borer, *D. minutus*, in Germany.]—*Anz. Schädlingsk.* **31** pt. 5 pp. 74–75, 3 figs., 18 refs. Berlin, 1958.

Bamboo imported into Germany from Japan in 1954 was found in 1955 to be infested by *Dinoderus minutus* (F.), notes on the habits and distribution of which are given.

QUEDNAU (W.). **Über einige Orientierungsweisen des Eiparasiten** *Trichogramma* (**Hym. Chalcididae**) **auf Grund von Licht- und Schwerereizen.** [Some modes of orientation of the egg-parasite, *Trichogramma*, to light and gravity.]—*Anz. Schädlingsk.* **31** pt. 6 pp. 83–85, 6 figs. Berlin, 1958.

Experiments are described, showing that newly emerged females of *Trichogramma* spp. are positively phototactic and negatively geotactic [*cf.* *R.A.E.*, A **48** 550].

v. SCHELLER (H. D.). **Massenvermehrung der Sitkafichtenlaus** *Elatobium* (=*Liosomaphis*) *abictina* **Walk. in Nordwestdeutschland.** [Mass increase of the Sitka-spruce aphid, *Rhopalosiphum abietinum*, in north-western Germany.]—*Anz. Schädlingsk.* **31** pt. 6 pp. 85–88, 4 figs., 13 refs. Berlin, 1958.

An outbreak of *Rhopalosiphum* (*Elatobium*) *abietinum* (Wlk.) occurred on Sitka spruce (*Picea sitchensis*) in Schleswig-Holstein in the spring of 1957. The habits and control of this aphid are discussed.

SCHÖNHERR (J.). **Ein aussergewöhnlicher Schaden durch** *Dendroctonus micans* **Kug.** [Unusual damage by *D. micans.*]—*Anz. Schädlingsk.* **31** pt. 6 pp. 88–90, 3 figs., 4 refs. Berlin, 1958.

The author records injury in western Germany by *Dendroctonus micans* (Kug.) round the area at the base of the trunks where spruce trees (*Picea pungens*) are grafted for the production of ornamental twigs.

EMMEL (L.). **Die Wirkung von Thiodan auf die Blutlaus** (*Eriosoma lanigerum* **Hausm.**) **und die Blutlauszehrwespe** (*Aphelinus mali* **Hald.**). [The effect of Thiodan on *E. lanigerum* and its parasites, *A. mali.*]—*Anz. Schädlingsk.* **31** pt. 8 pp. 121–123, 1 fig. Berlin, 1958.

In experiments in Germany, sprays of Thiodan gave excellent control of *Eriosoma lanigerum* (Hsm.) on apple in the greenhouse, without harming its parasite, *Aphelinus mali* (Hald.), developing in it [*cf.* *R.A.E.*, A **48** 544].

LAUBMANN (M.). **Beitrag zur Kenntnis der Biologie von** *Tribolium destructor* (**Uytt.**). [Contribution to knowledge of the bionomics of *T. destructor.*] —*Anz. Schädlingsk.* **31** pt. 9 pp. 138–140, 16 refs. Berlin, 1958.

The observations recorded showed that adults of *Tribolium destructor* Uytt. are unable to reproduce in uninjured cereal seeds, except in those of maize, can persist in many stored products for over 200 days without reproducing, survive for up to 18 months, and require not more than a week at 24°C. [75·2°F.] to reach sexual maturity.

PILTZ (H.). **Die Mittelmeerfruchtfliege in Deutschland.** [The Mediterranean fruit-fly in Germany.]—*Anz. Schädlingsk.* **31** pt. 12 pp. 177–180, 21 refs. Berlin, 1958. (With a summary in English.)

Ceratitis capitata (Wied.) is found from time to time breeding in fruits grown in Germany [*cf.* *R.A.E.*, A **25** 584], and the possibility of its becoming established there is discussed. The most recent outbreak was in 1955.

Blunck (H.), Krieg (R.) & Scholtyseck (E.). **Weitere Untersuchungen über die Mikrosporidien von Pieriden und deren Parasiten und Hyperparasiten.** [Further investigations on the Microsporidia of Pierids and their parasites and hyperparasites.]—*Z. PflKrankh.* **66** pt. 3 pp. 129–142, 9 figs., 31 refs. Stuttgart, 1959. (With a summary in English.)

From tests of their pathogenic effects, which are described, it is concluded that *Nosema polyvora*, a species of the same genus resembling *Perezia legeri* (which the authors consider should be placed in *Nosema*), *P. mesnili* and a species of *Plistophora* close to *P. schubergi* are unsuited for the biological control of *Aporia crataegi* (L.).

Kudler (J.) & Hochmut (R.). *Cacoecia crataegana* **Hb. als derzeitiger Grossschädling in den mährischen Eichenbeständen.** [*Archips crataeganus* as a major pest of oak stands in Moravia.]—*Z. PflKrankh.* **66** pt. 3 pp. 142–149, 8 figs., 16 refs. Stuttgart, 1959. (With a summary in English.)

An outbreak of *Archips* (*Cacoecia*) *crataeganus* (Hb.) occurred in forests of oak in the lowlands near Olomouc, Czechoslovakia, in 1957. As nothing was known of this Tortricid as a forest pest, observations were made. Its bionomics were found to resemble those of *Tortrix viridana* (L.), but it is polyphagous and therefore does not suffer from lack of food in mixed forests. Counts of the egg-batches, which are conspicuous, proved suitable for population estimates. The outbreak was terminated mainly by bacterial disease and parasitism by Ichneumonids, chiefly *Itoplectis maculator* (F.). A DDT aerosol generated from portable apparatus afforded little control, but treatment from the air might have given better results.

Dosse (G.). **Ein bisher unbekanntes Schadbild von** *Plutella maculipennis* **Curt. an Winterraps und Senf mit Ergänzungen zur Morphologie der Larven.** [A hitherto unknown type of damage by *P. maculipennis* on winter rape and mustard, with supplements on the morphology of the larvae.]—*Z. PflKrankh.* **66** pt. 3 pp. 150–156, 7 figs., 5 refs. Stuttgart, 1959. (With a summary in English.)

Plutella maculipennis (Curt.) was numerous on winter rape and mustard [*Sinapis alba*] near Stuttgart in 1958, and as the former is seldom attacked, the damage is described and illustrated. The younger larvae fed on or in the pods and seeds, and the older ones destroyed the late flowers and shoots. In view of inconsistencies in the literature, certain characters of the larvae are described.

Heinze (K.). **Übertragungsversuche mit dem Blattrollvirus der Feldbohne.** [Transmission tests with leaf-roll virus of broad beans.]—*Z. PflKrankh.* **66** pt. 4 pp. 220–221, 3 refs. Stuttgart, 1959. (With a summary in English.)

The leaf-roll virus of broad beans [*Vicia faba*] and peas is known to be transmitted in the persistent fashion by *Macrosiphum pisum* (Harris) (*Acyrthosiphon onobrychis* (Boy.)), but the period of incubation in the insect had not been determined. In tests with broad beans, it was found to be occasionally as short as 10 hours, but normally 1·5–2 days. In daily transfers, 10–14 successive plants were infected.

STEINER (H.) & NEUFFER (G.). **Verbesserte Fängigkeit der Stuttgarter Insekten-Lichtfalle. Ein Nachtrag.** [Improved attractiveness of the Stuttgart light-trap. A postscript.]—*Z. PflKrankh.* **66** pt. 4 pp. 221–223, 3 figs., 2 refs. Stuttgart, 1959. (With a summary in English.)

The light-trap designed by the authors for operation by a battery [*R.A.E.*, A **48** 160] was improved by modifications that are described. These made it correspond more closely to the Pennsylvania light-trap. The trap proved useful for observations on Microlepidoptera in orchards in Germany.

SMITH (K. M.) & LAUFFER (M. A.). Ed. **Advances in virus research. Volume V.**—9¼ × 6 in., ix + 376 pp., illus., many refs. New York, N.Y., Academic Press, Inc.; London, Academic Books, Ltd., 1958. Price $9.50. **Volume VI.**—9¼ × 6 in., viii + 382 pp., illus., many refs. 1959. Price $10.

These further volumes in a series comprising critical reviews of research on viruses [*cf. R.A.E.*, A **45** 229, etc.] each include one review of entomological interest. That in the first, by P. L'Héritier (pp. 195–245, 4 graphs, 51 refs.), is on the hereditary virus of *Drosophila melanogaster* Mg., and that in the second, by L. Broadbent & C. Martini (pp. 93–135, 6 pp. refs.), is on the spread of plant viruses and includes a survey of the importance of various insects and mites in this respect.

EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANISATION. **San José scale in Europe and the Mediterranean Basin in 1959.** [*In English & French.*]—[3 +] x + 10 pp., multigraph. Paris, 1960.

The distribution and occurrence of *Quadraspidiotus perniciosus* (Comst.) in Europe and Algeria is reviewed as for earlier years [*cf. R.A.E.*, A **47** 354, etc.]. The scale spread slightly in a few of the countries already infested, but appeared in no fresh ones.

KOLUBAJIV (S.). **Příspěvek k bionomii, ekologii a gradologii smrkových pilatek skupiny Nematini.** [Contributions to the bionomics, ecology and knowledge of outbreaks of spruce sawflies of the group Nematini.]—*Sborn. čsl. Akad. zeměd. Věd* Lesnictví **4** (**31**) pt. 2–3 pp. 123–150, 27 figs., 53 refs. Prague, 1958. **Boj se smrkovými pilatkami pozemním a leteckým poprašováním a použitím aerosolů.** [The control of spruce sawflies by ground and aerial dusting and by aerosols.]—*T. c.* pt. 4 pp. 193–212, 3 figs., 46 refs. (With summaries in Russian & German.)

It is reported in the first paper that a mass outbreak of three sawflies, *Pachynematus scutellatus* (Htg.), *P. montanus* (Zadd.) and *Pristiphora* (*Lygaeonematus*) *abietina* (Christ), occurred on spruce in Czechoslovakia in 1948–55, *Pachynematus scutellatus* being the most injurious and reaching significant numbers there for the first time. The progress of the outbreak was studied by examining the abundance and condition of the overwintering cocoons, which were collected in the spring and autumn of each year from forest litter. The numbers of *P. scutellatus* gradually decreased while those of *Pristiphora abietina* increased. Parasitism was low, but the overwintering cocoons of all three species were attacked by a fungus, *Spicaria farinosa verticilloides*, and larvae of *Pachynematus scutellatus* feeding during the summer were considerably reduced by seagulls.

It is stated in the second paper that chemical control by dusting from the air and from ground apparatus, principally with DDT but also with BHC, was begun against the larvae in 1950. However, similar treatment against the newly emerged adults, particularly the females, which were the more susceptible, was found more effective in the later years and less harmful to natural enemies, most of which were still in their winter quarters, but the dusts had to be applied more than once because of the prolonged emergence period.

RAINEY (R. C.). **Atmospheric movements and the biology of the desert locust** (*Schistocerca gregaria* **Forskål**).—*Proc. Linn. Soc. Lond.* 169 Sess. 1956–57 pt. 1–2 pp. 73–74. London, 1958.

The information here given on the influence of atmospheric turbulence on movements of flying swarms of *Schistocerca gregaria* (Forsk.) has already been noticed [*R.A.E.*, A **39** 413; **47** 98]. Although rain is essential for successful breeding, this locust usually breeds in areas with an average annual rainfall of only 5–10 in., and the swarms in general travel from areas where the seasonal rains have ended to others where they are beginning. All swarm movements for which adequate evidence is available have been directly downwind. Such movement leads in general from zones of divergent into zones of convergent air-flow. Air rises above zones of convergence, at the boundaries of which there is a net excess of in-flowing over out-flowing air, and convergence is essential in the production of widespread heavy rain. The hypothesis that major displacements of swarms take place downwind can account for both the general seasonal pattern of movements between regular breeding areas and all exceptions that have been investigated.

PAPERS NOTICED BY TITLE ONLY.

GIANG (P. A.) & SCHECHTER (M. S.). **Colorimetric determination of residues of phorate and its insecticidally active metabolites.**—*J. agric. Fd Chem.* **8** no. 1 pp. 51–54, 9 refs. Easton, Pa., 1960.

PATCHETT (G. G.) & BATCHELDER (G. H.). **Determination of Trithion crop residues by cholinesterase inhibition measurement.**—*J. agric. Fd Chem.* **8** no. 1 pp. 54–57, 9 refs. Easton, Pa., 1960.

ANGLIN (C.) & MCKINLEY (W. P.). **Procedure for cleanup of plant extracts prior to analyses for DDT and related pesticides.**—*J. agric. Fd Chem.* **8** no. 3 pp. 186–189, 2 graphs, 10 refs. Easton, Pa., 1960.

ZWEIG (G.) & ARCHER (T. E.). **Quantitative determination of Thiodan by gas chromatography.**—*J. agric. Fd Chem.* **8** no. 3 pp. 190–192, 4 graphs, 4 refs. Easton, Pa., 1960.

SCHMIDT (L.). *Otiorrhynchus* (*Dodecastichus*) *mastix* **Ol. ein neuer Schädling der Erdbeeren.** [*Otiorhynchus mastix*, a new pest of strawberry (in Yugoslavia).]—*Anz. Schädlingsk.* **31** pt. 1 pp. 4–6, 3 figs. Berlin, 1958.

DAVIES (J. C.). **Coleoptera associated with stored products in Uganda.**—*E. Afr. agric. J.* **25** no. 3 pp. 199–201, 4 refs. Nairobi, 1960.

ZIA (H. C.), HSIANG (H.), LUH (W. S.) & CHANG (H. C.). **Studies on the pink bollworm** (*Platyedra* [*Pectinophora*] *gossypiella* **Saund.**) **infesting tree cotton in Yunnan. I. Location of hibernation quarters and observation on date of the maximal flight of moths.** [*In Chinese.*]—*Acta oecon.-ent. sin.* **1** no. 2 pp. 135–143, 2 graphs, 3 refs. [Peking] 1958. (With a summary in English.)

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INDEX OF AUTHORS

ANON., 2, 18, 47.
Adkisson, P. L., 35.
Agarwal, R. A., 15.
Al-Azawi, A. F., 29.
Andres, L. A., 26.
Anglin, C., 48.
Annecke, D. P., 9.
Archer, T. E., 48.
Areekul, S., 41.
Arora, G. L., 14.
Arthur, B. W., 36.

Bahadur, J., 13.
Bailey, J. B., 19.
Batchelder, G. H., 48.
Berck, B., 43.
Beri, Y. P., 13.
Bird, F. T., 17.
Blunck, H., 46.
Bowery, T. G., 19.
Breese, M. H., 6.
Brezner, J., 39.
Broadbent, L., 47.
Brogdon, J. L., 41.
Brown, A. L., 42.
Bünzli, G. H., 7.
Burton, V. E., 30.
Butani, D. K., 14.
Büttiker, W. W., 7.

Casida, J. E., 17, 42.
Chang, H. C., 48.
Chang (Hwei-chien), 15.
Chang (Tseh-pu), 15.
Clancy, D. W., 40.
Clark, E. W., 36.
Coan, R. M., 23.
Cochran, B. J., 35.
Cole, S. G., 33.
Concienne, E. J., 21.
Conrad, M. S., 24.
Coon, B. F., 35.
Cowan jr., C. B., 34.
Crawford, C. S., 33.
Crowell, H. H., 24.
Curie, W. E., 39.

Dahm, P. A., 18.
Das, G. M., 3.
Dauterman, W. C., 42.
Davies, J. C., 48.
Davis, J. W., 34.
Ditman, L. P., 20, 23.
Donley, D. E., 37.
Dosse, G., 46.
Driggers, B. F., 21.
Du (I-lung), 16.
Duncan, R. B., 30.
Durham, W. F., 42.

Eldefrawi, M. E., 41.
Elliott, J. W., 42.
Emmel, L., 45.
Eslyn, W. E., 17.

Fernando, H. E., 5.
Finlayson, D. G., 24.
Fiori, B. J., 30.
Fisher, R. W., 37.
Flanders, S. E., 26.
Fowkes, F. M., 43.
Fraenkel, G., 16.
Fronk, W. D., 31.

Gabriel, B. P., 17.
Garman, P., 22.
Gauss, R., 44.
Getzendaner, C. W., 39.
Giang, P. A., 48.
Gordon, H. T., 41.
Grigarick, A. A., 37.
Gunther, F. A., 44.
Gupta, R. L., 15.
Guthrie, F. E., 19.
Gyrisco, G. G., 23, 28.

Hackerott, H. L., 32.
Hall, I. M., 26.
Harein, P. K., 32.
Harries, F. H., 38.
Harrison, F. P., 23.
Harvey, T. L., 32.
Harwood, R. F., 33, 41.
Heinze, K., 46.
Henneberry, T. J., 40.
Hensley, S. D., 21.
Henson, W. R., 24.
Hightower, B. G., 23.
Hochmut, R., 46.
Hofmaster, R. N., 29.
Howitt, A. J., 24, 33.
Hsiang, H., 48.
Hyche, L. L., 36.

Ingram, W. R., 5, 7.

Jen (I-sen), 16.
Jeppson, L. R., 44.
Jepson, W. F., 3.
Johnson, N. E., 22.
Jotwani, M. G., 11.
Jurinak, J. J., 42.

Kanakaraj David, S., 12.
Kao (Chi-teh), 15.
Kirkpatrick, M. E., 41.
Klostermeyer, E. C., 35.
Kolubajiv, S., 47.
Krieg, R., 46.
Kudler, J., 46.

LaDue, J. P., 25.
Lai (Wen-chang), 16.
Lall, B. S., 14.
Landis, B. J., 39.
Laubmann, M., 45.
Lauffer, M. A., 47.
Lavigne, R., 29.
Levenbook, L., 16.
L'Héritier, P., 47.
Liao (Yu-meh), 16.
Lisk, D. J., 42.
Lloyd, J. H., 8.
Locke, R., 36.
Long, W. H., 21.
Luh, W. S., 48.

McCormick, W. J., 21.
McKinley, W. P., 48.
Madsen, H. F., 19.
Malina, M. A., 43.
Martin, P. E., 42.
Martini, C., 47.
Mathias, P., 3.
Matthews, R. H., 41.
Mattson, A. M., 41.
Maw, M. G., 2.
Menn, J. J., 41.
Meyer, C. F., 43.
Michelbacher, A. E., 31.
Mistric jr., W. J., 20, 38.
Muma, M. H., 40.

Neuffer, G., 47.
Neunzig, H. H., 28.
Newsom, L. D., 21.
Nielson, M. W., 39.
Norris jr., D. M., 29.

Oatman, E. R., 25, 28.
O'Brien, R. D., 42.
Odhiambo, T. R., 4.
Okumura, G. T., 22.

Pajni, H. R., 14.
Parencia jr., C. R., 34.
Patchett, G. G., 48.
Peng, C. W., 16.
Penick, A. E., 42.
Peterson jr., G. D., 38.
Piltz, H., 45.
Polen, P. B., 43.
Pradhan, S., 11, 13.
Puttarudriah, M., 12.

Quednau, W., 45.

Rabb, R. L., 19.
Rai, B. K., 11.
Rainey, R. C., 48.
Reed, J. P., 34.
Richmond, C. A., 36.
Ridgway, R. L., 23.
Riehl, L. A., 25, 27.
Rivnay, E., 10.
Rodriguez jr., J. L., 25.

Sankaran, T., 11.
Sarup, P., 13.
Sbur, D. E., 22.
Schechter, M. S., 48.
Schefer-Immel, V., 44.
v. Scheller, H. D., 45.
Schmidt, L., 48.
Scholtyseck, E., 46.
Schönherr, J., 45.
Scott, D. R., 24.
Sedlak, V. A., 41.
Sharma, A. K., 12.
Shaw (Kang-you), 15.
Sindhu, A. S., 13.
Singh, Sardar, 13.
Sivashankara Sastry, K. S., 12.
Smith, E. H., 30.
Smith, F. F., 40.
Smith, K. M., 47.
Specht, H. B., 21.
Spyhalski, E. J., 20.
Srivastava, U. S., 13.
Stark, R. W., 24.
Steiner, H., 47.
Steinhauer, A. L., 20, 33.
Steinhaus, E. A., 18.
Stermer, R. A., 27.
Steudel, W., 44.
Strong, R. G., 22.
Subba Rao, B. R., 12.
Sun (Chen-yang), 16.
Sutić, M., 18.
Swirski, E., 10.
Sylvester, E. S., 30.

Tanada, Y., 37.
Taylor, E. A., 40.
Thomas, H. A., 21.

Vanderzant, E. S., 39.
Venugopal, S., 14.
Viado, G. B., 42.

Walker, D. W., 36.
Walker, K. C., 42.
Wallace, C. R., 7.
Walz, A. J., 24.
Waterhouse, J. S., 27.
Wedding, R. T., 27.
Whalley, P. E. S., 2.
Whitney, W. K., 32.
Wiley, R. C., 20.
Wilkes, L. H., 35.
Williamson, A. L., 36.
Winteringham, F. P. W., 17.

Yamafuji, K., 17.
Yang (Hsui-yuan), 15.
Yathom, S., 10.
Young, V. L., 16.
Yule, W. N., 4, 8.

Zia, H. C., 48.
Zweig, G., 48.

CONTENTS.

PAGE

Editorial: Nomenclature of chemicals used in pest control ... 1
Africa: Dieldrin lattices for controlling hoppers of *Nomadacris septemfasciata* ... 4
Africa: Control of *Hemitarsonemus latus* on cotton in Uganda ... 5
Africa: Insecticides against stalk-borers on sorghum in Uganda ... 7
Africa: Investigations on *Myzus persicae* in Southern Rhodesia ... 7
Africa: Migration of hopper bands of *Nomadacris septemfasciata* 8
Africa: Effect of parathion on natural control of *Coccus hesperidum* ... 9
Africa: Coleoptera associated with stored products in Uganda (*Title only*) 48
Britain: *Pristiphora erichsonii* and its parasite ... 2
Britain: Phorate controlling *Oscinella frit* on sweet maize ... 3
Canada: Chemical control of *Hylemyia antiqua* ... 24
Ceylon: The bionomics of *Scotinophara lurida* on rice ... 5
China: *Dichocrocis punctiferalis* injuring sunflower ... 15
China: Demeton seed treatment protecting cotton from *Aphis gossypii* ... 15
China: *Ostrinia nubilalis* on maize in Hunan ... 16
China: *Dacus tsuneonis* infesting *Citrus* fruits ... 16
China: The bionomics of *Ceracris kiangsu* ... 16
China: HCN fumigation of *Citrus* stocks against Coccids and mites ... 16
China: *Pectinophora gossypiella* on tree cotton in Yunnan (*Title only*) ... 48
Czechoslovakia: *Archips crataeganus* in forests and its control ... 46
Czechoslovakia: An outbreak of spruce sawflies and their control ... 47
Europe: Distribution of *Quadraspidiotus perniciosus* in 1959 ... 47
Germany: Moths damaging aspen catkins ... 44
Germany: *Rhopalosiphoninus staphyleae tulipaellus* transmitting beet yellows 44
Germany: *Dinoderus minutus* in imported bamboo ... 44
Germany: An outbreak of *Rhopalosiphum abietinum* on Sitka spruce ... 45
Germany: Unusual damage by *Dendroctonus micans* ... 45
Germany: Thiodan and *Aphelinus mali* parasitising *Eriosoma* ... 45
Germany: Occasional occurrence of *Ceratitis capitata* ... 45
Germany: *Plutella maculipennis* attacking rape ... 46
India: *Oligonychus coffeae* and pruning and defoliation of tea ... 3
India: Two newly recorded parasites of *Phenacoccus insolitus* ... 11
India: Relative toxicity of insecticides to insects ... 11, 13
India: Three new species of aphids ... 12
India: Two new parasites of *Macrosiphum pisum* ... 12
India: Rearing and attempted use of *Tetrastichus ayyari* ... 12
India: A new parasite of *Aphis gossypii* on egg-plant ... 12
India: The life-history of *Dysdercus cingulatus* ... 13
India: Sprays against *Thrips tabaci* on cotton ... 13
India: Parasites and predators of sugar-cane pests ... 14
India: Bionomics and control of *Hyposidra talaca* on *Sesbania speciosa* ... 14
India: The bionomics of *Apanteles obliquae* parasitising *Diacrisia obliqua* 14
India: A bait-spray against *Dacus dorsalis* ... 15
India: *Aphrophora sigillifera* found on sugar-cane ... 15
Israel: Sprays against *Earias insulana* on cotton ... 10
Israel: The control of *Phyllocoptruta oleivora* on *Citrus* ... 10
St. Helena: A survey of pests of crops ... 7
U.S.A.: *Beauveria bassiana* attacking pupae of *Hemerocampa pseudotsugata* ... 17
U.S.A.: A possible virus disease of *Panonychus ulmi* ... 18
U.S.A.: *Dacus dorsalis* found in California ... 18
U.S.A.: Sampling lucerne for estimation of residues of azinphos-methyl ... 18
U.S.A.: Sprays against *Protoparce sexta* on tobacco ... 19
U.S.A.: Control of *Aegeria exitiosa graefi* on apricot ... 19
U.S.A.: Phorate for seed treatment of cotton ... 20
U.S.A.: Insecticides against pests of broccoli and cabbage ... 20
U.S.A.: Sprays for use in apple orchards ... 21, 22
U.S.A.: Insecticide granules against *Diatraea saccharalis* ... 21
U.S.A.: A further species of *Chermes* on firs in Washington ... 22
U.S.A.: Distribution and food range of *Trogoderma* spp. in California ... 22
U.S.A.: Sprays against insects on *Lotus corniculatus* ... 23
U.S.A.: Treatments against *Spodoptera frugiperda* on maize ... 23
U.S.A.: *Ceratomegilla maculata* and the eggs of *Ostrinia nubilalis* ... 24
U.S.A.: Chemical control of *Hylemyia antiqua* ... 24
U.S.A.: Ethion in oil sprays against *Citrus* pests ... 25
U.S.A.: Effect of sprays on *Panonychus ulmi* ... 25
U.S.A.: Field evaluation of *Bacillus thuringiensis* against Lepidopterous larvae ... 26
U.S.A.: Effects of oil composition on photosynthesis of lemon leaves ... 27

[*Continued on p. iv of cover*

CONTENTS—*cont.*

PAGE
U.S.A.: The natural control of *Liriomyza pictella* 28
U.S.A.: Parasites of *Bruchophagus* on leguminous crops 28
U.S.A.: Amiton oxalate preventing transmission of Dutch elm disease ... 29
U.S.A.: *Philaenus leucophthalmus* in Massachusetts 29
U.S.A.: Control of *Empoasca fabae* on potato 29
U.S.A.: Demeton for the control of beet yellows 30
U.S.A.: The use of *Conotrachelus nenuphar* in toxicological studies 30
U.S.A.: The problem of mites on walnut in California 31
U.S.A.: *Hypera variabilis* and its control in Wyoming 31
U.S.A.: Resistance of lucerne to *Therioaphis maculata* 32, 39
U.S.A.: The bionomics of *Bruchus brachialis* in Oregon 33
U.S.A.: Control of resistant *Psila rosae* on carrot in Washington 33
U.S.A.: Lepidoptera associated with grasses in Washington 33
U.S.A.: Granular insecticides against pests of maize 34
U.S.A.: Control of cotton pests 34, 35
U.S.A.: Insecticides affecting mites on lucerne 35
U.S.A.: Grasses as food-plants of cereal aphids 35
U.S.A.: Systemic insecticides against *Dialeurodes citri* on *Gardenia* ... 36
U.S.A.: The control of *Trichoplusia ni* on celery 37
U.S.A.: Persistence of a trunk treatment with mevinphos 37
U.S.A.: Tractor damage to cotton in insecticide applications 38
U.S.A.: *Vanessa cardui* on lucerne and its control 38
U.S.A.: *Blaniulus guttulatus* damaging seed potatoes 39
U.S.A.: *Aphytis lepidosaphes* parasitising *Lepidosaphes beckii* in Florida 40
U.S.A.: The control of resistant *Tetranychus telarius* in greenhouses ... 40
YUGOSLAVIA: Aphids causing symptoms on sunflower 18
YUGOSLAVIA: *Otiorhynchus mastix* infesting strawberry (*Title only*) ... 48
Maps of the distribution of arthropod pests 2
Generic assignment of species formerly included in *Ephestia* 2
Pseudodoniella szentivanyi a synonym of *P. laensis* 4
Infestation of rough rice by *Sitophilus sasakii* and *Rhyzopertha dominica* 6
DDT repelling *Plutella maculipennis* 13
Effect of mercury on *Callosobruchus analis* 14
Biochemistry of insects (*Review*) 16
Fungus infection of insects through the alimentary tract 17
Polyhedrosis and granulosis viruses of *Choristoneura fumiferana* 17
Effects of climatic factors on the toxicity of phosphorus insecticides ... 23
The description of insect numbers 24
Pseudococcus citriculus and its parasites 26
Responses of stored-product insects to light 27
Laboratory method for evaluating insecticides against *Scutigerella immaculata* 27
Factors affecting the reliability of fumigant tests 32
Improved Berlese funnel for collecting diapause larvae of *Pectinophora* ... 36
Malathion and the odour of stored wheat 36
Polybutenes for the control of phytophagous mites 37
Physical properties of derris dusts and their toxicity to *Epilachna* ... 38
Inositol and the development of *Anthonomus grandis* 39
An electrically operated micro-dispenser 39
Two organisms for bioassay of acaricides 41
Pre-chromatographic purification of insecticides 41
Effect of γ BHC on the flavour of cantaloups 41
Urine analysis for measuring exposure to phosphorus insecticides ... 41, 42
Determination of ethylene dibromide in soils 42
Persistence of dimethoate and its metabolites following foliar application ... 42
Rapid combustion and determination of residues of chlorinated insecticides ... 41
Acrylonitrile for fumigation of shelled walnuts 43
Determination of heptachlor epoxide in fat and milk 43
Clay-catalysed decomposition of insecticides 43
Modern insecticides and world food production (*Review*) 44
Orientation of *Trichogramma* spp. 45
Observations on the bionomics of *Tribolium destructor* 45
Microsporidia and control of *Aporia crataegi* 46
Macrosiphum pisum and the leaf-roll virus of broad beans 46
An improved Stuttgart light-trap 47
Advances in virus reseach, Vol. V (*Review*) 47
Atmospheric movements and *Schistocerca gregaria* 48
Colorimetric determination of residues and metabolites of phorate (*Title only*) 48
Determination of Trithion crop residues (*Title only*) 48
Treatment of plant extracts for analysis for DDT (*Title only*) 48
Quantitative determination of Thiodan by gas chromatography (*Title only*) ... 48

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